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**ORIGINAL COMMUNICATIONS.**

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**REPORT OF FIVE INTERESTING CASES OF LATERAL  
SINUS THROMBOSIS.\***

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*Case 1:* Private T., entered the hospital on October 20, 1918, complaining of pain in, and discharge from, the left ear. He was also complaining of rather severe pain in the upper abdomen, accompanied by anorexia of eight days' duration, occasional vomiting and constipation.

The patient had been in the service (Quartermaster's Department) for thirteen months, and enjoyed apparently good health. He was 23 years of age, of slight physique, and had worked as a laborer in civilian life. His family and venereal history was negative. There was no history of previous illnesses, other than measles contracted at the age of 5 years, and some gastric trouble at the age of 15 years. From early childhood, probably following his attack of measles (although this point could not be definitely determined), the patient had occasional attacks of slight pain in the left ear, accompanied by an intermittent discharge. During the past three years, the discharge had become very offensive, but continued to remain intermittent in character.

Upon examination, the general picture was that of a young adult, only fairly well nourished, who looked sick, weak and septic.

\*From the service of Major Holmes, Base Hospital, Camp Sherman, Ohio.

Examination of the lungs, heart, abdomen, genitalia and reflexes presented normal findings.

On examining the ears, the right showed moderate retraction of the drum, but was otherwise normal. The left ear presented a profuse, foul-smelling discharge. There was no mastoid tenderness, and no tenderness upon moving the external ear. The perforation in the drum could not be definitely defined, but the pus was apparently coming through an opening in the anterior portion. The posterior half of the drum appeared to be thickened, red and bulging. A myringotomy was done, opening both posterior quadrants.

Hearing, noted at the bedside, was good in the right ear. Spoken voices could be heard in the left ear, but watch was not heard on contact.

The nose showed an irregular deviation of the septum, but there was no pus or indication of sinus involvement. Transillumination was not made. The tonsils were small, and apparently not diseased.

A culture taken from the external auditory canal of the diseased ear showed a small, well-growing gram positive bacillus. The urine was negative. White blood count showed 9,600 leucocytes, with 87 per cent polymorphonuclears. The temperature was 103.6; pulse 86, and respiration 26. The breath was foul, tongue thickly coated, and the bowels constipated.

During the few days following his entrance to the hospital, the patient continued to complain of pain in the upper abdomen, refused food, and remained depressed. There was no complaint of pain in the ear. On the fourth day after entrance, the patient had a slight chilly sensation, but no distinct chill. Temperature rose to 104, with profuse sweat. A second myringotomy was done, and the temperature dropped to normal. The leucocyte count was 25,400, with 81 per cent of polymorphonuclears. A blood culture taken on that day remained sterile at the end of three days.

On the fifth day after entrance, the patient had another short chilly sensation, with a temperature of 103.8. On the following day, a radical mastoidectomy was performed. A small infected cholesteatoma was found in the antrum, extending into the middle ear, and eroding well into the bone of the middle cranial fossa, in the region of the antrum. The dura, in this area, was exposed during the operation, but no abnormal changes were noted. Upon removing the ossicles from the middle ear, the incus was not found, while the malleus appeared to be well preserved. There was no exposure of the sinus.

Gas oxygen anesthesia was given; not without difficulty, as the patient responded poorly in his weakened condition.

A culture taken from the antrum revealed a gram positive bacillus and streptococcus hemolyticus.

On the evening of the second day following the operation, the temperature rose to 104.2. There was a slight chilly sensation, but no distinct chill. The temperature remained high, and on the fifth day following the operation, patient had a severe chill. There was a profuse sweat, and temperature rose to 105, followed by a sudden drop to normal. On the following day, another chill occurred, and the temperature rose suddenly to 106.8. The pulse was 150 and of poor quality. The patient looked extremely septic; death seemed imminent.

It had already been decided, at a consultation held on the day previous, that the patient, owing to his depleted condition and his bad response to the previous anesthesia, would not live through an operation on the lateral sinus, which was deemed necessary. Blood counts, made every other day, ranged from 15,000 to 18,000 leucocytes, representing only a fair reaction for the high rises in temperature accompanying the suspected sinus involvement.

On the day following the extreme temperature and weakness, the patient seemed somewhat stronger and it was decided to do a lateral sinus operation under gas oxygen anesthesia. Examination of spinal fluid was negative, and there were no meningeal symptoms.

At the operation, the lateral sinus was exposed. There were no granulations, nor was there any evidence of perisinusitis. The pulsating sinus appeared to be somewhat redder than normal, but no other changes were noted. The small exposure of the dura, made at the previous operation, in the region of the antrum, was being enlarged backwards and downwards for a short distance, when suddenly foul pus welled up along the dura. Upon additional exposure, the dura over the lower temporal lobe, and extending back into the occipital area, was found to be necrotic and perforated. Through the perforation, an intradural abscess was drained. There was no evidence of extension into the brain. The patient's condition was bad, and no further exploration of the sinus was attempted, although we could not help feeling that the intradural abscess was too well walled off to account for the severe chills and extreme rises of temperature.

Blood culture taken at this time was sterile during an observation period of three days.

Following the operation, patient had a daily sharp rise in temperature, usually accompanied by a chill. There was complete anorexia. A 5 per cent glucose mixture was given, four ounces every three hours, per rectum. Leucocyte count rose to 25,800, then suddenly dropped to 14,000.

There was no disturbance of speech; no delirium, nausea or vomiting; no pupillary changes or changes in the eye grounds; no Kernig, rigidity of the neck, or severe headache. From the opening in the dura, there continued a discharge of very foul yellow, thick pus.

On the fourth day following the operation, patient suddenly developed a severe sharp pain in the left upper abdomen. This remained present almost constantly until death, and was somewhat increased upon deep breathing. There was no evidence of pleurisy on this side. A splenic infarct was suspected.

The patient died seven days after draining the intradural abscess. The autopsy was an extremely interesting one, revealing a superficial cerebral abscess, involving the temporal and occipital areas, just above the attachment of the tentorium cerebelli. Section of the brain showed no deep involvement.

There was a double lateral sinus thrombosis, which had apparently extended from the left side through the torculi, without producing any evidence of extension into the longitudinal sinus. The left jugular bulb showed advanced necrosis. Both sphenoidal sinuses and the right frontal sinus showed an active, chronic catarrhal condition. Incidentally, a surprisingly large number of all suppurative conditions of the ear are accompanied by involvement of one or more of the nasal accessory sinuses, and we are making it a routine to examine carefully all sinuses of patients exhibiting a suppurative ear condition.

The right pleural cavity presented a moderate serous effusion. The right upper lobe showed a distinct small abscess, undoubtedly metastatic in origin. There was a beginning right bronchopneumonia.

The pericardium contained about 150 c.c. of clear, serous fluid.

A sharply circumscribed, deep ulcer was found on the costodiaphragmatic edge of the spleen, thus accounting for the sudden and continued pain in the left upper abdomen. Streptococcus hemolyticus was obtained from this abscess, as well as from the abscess in the right lung.

The above case represents one of the most dangerous mastoid conditions with which we have to deal,—a chronic mastoiditis with

an infected cholesteatoma. In no suppurative ear condition are sinus thrombosis and intracranial complications so frequent.

From the pathological findings and the history, this patient probably had a cholesteatoma for at least three or four years prior to the operation, yet upon examination the drum appeared to be practically intact, the discharge coming from a slit-like opening well anterior, which was difficult to determine.

The autopsy revealed a most advanced thrombosis of the lateral sinus on the discharged ear, with extension to the opposite side, yet there was no involvement of the longitudinal sinus.

Also of interest was absence of any changes in the eye grounds. Many aurists have probably seen choked disc, or optic neuritis, sometimes present following a jugular resection, on the side corresponding to the jugular resected, or even in both eyes, as was demonstrated in one of our cases.

The sinus, as exposed during the second operation, was interesting in its absence of evidence of perisinus involvement; the wall was somewhat redder than normal, otherwise no changes were evidenced. Yet, undoubtedly, the thrombosis was already present.

From several cases that we have observed here, it would seem that sinus thrombosis with a streptococcus hemolyticus infection is rather conspicuous by the absence of granulations and perisinus changes.

*Case 2:* The following patient, Private H. B., entered the hospital on the evening of October 23, 1918, with a cough, pain in the upper portion of the chest, and general malaise. There was a history of headache and debility for two days prior to entrance.

His temperature upon entering the ward was 103; pulse 102, and respiration 24. A diagnosis of broncho-pneumonia was made at the receiving office, but within forty-eight hours the temperature had dropped to normal, an acute tonsillitis and rhinitis probably accounting for his indisposition.

According to the previous and personal history, the patient, age 28 years, was born in Texas. He was a farmer by occupation; had a wife and one child living, and well. Other family history was negative. He had been subject to attacks of malaria each summer for a number of years, until the past summer when he felt free of the disease. There was a history of gonorrhea and chancre occurring ten years ago.

General physical examination revealed a well nourished colored male, with no abnormal chest, abdominal, or reflex findings.

On the third day following his entrance to the hospital, patient complained of pain in the right ear. Twenty-four hours later, the drum was found to be red and bulging, and a myringotomy was done. The ear continued to discharge without mastoid tenderness for six days, when the temperature was normal; the discharge, which gave a culture of non-hemolytic streptococci, had ceased, and the ear drum appeared to be clearing. Two days later, however, the temperature rose to 100.4, the ear drum showed increased injection, and there was a slight tenderness, upon firm pressure, over the antrum. A second myringotomy was done. The leucocyte count was 22,000, with 86 per cent polymorphonuclears. The urine was negative, and there were no abnormal chest findings. Within twenty-four hours, the temperature rose to 104.2, without chill or undue increase in respirations.

The following morning, a simple mastoidectomy was performed under gas oxygen anesthesia. The mastoid was of a pneumatic type, and the cells were filled with pus, which, culturally, revealed streptococcus hemolyticus. A perisinus abscess was found on the superior border, near the knee of the sinus. There were no granulations in this area, but the sinus presented a peculiar gray color.

The patient left the table in good condition. The temperature remained about 103 until evening, when it dropped to 99.6; the patient was comfortable and seemed to be doing well. The following afternoon, however, the temperature rose to 102, and between midnight and the next morning there were three distinct attacks of chilly sensations. The temperature continued to rise during that day, and there was a slight nervousness in the afternoon, but otherwise no discomfort. By midnight, the temperature had slowly risen to 103. There was a sudden onset of delirium, and several orderlies were required for restraint. One-fourth grain of morphin and 1-150 of atropin were given hypodermatically, and the patient went to sleep; the breathing became somewhat stertorous, and within six hours he was dead.

Necropsy revealed a well-formed fibrino-purulent thrombus of the right lateral sinus, with little or no granulations on the external wall.

The cerebellum, especially on the right side, was covered with a fibrino-purulent exudate. The dura about the angle of the lateral sinus was thickened and showed signs of beginning necrosis. There were no metastatic foci of infection found in the lungs, spleen or elsewhere in the body.

The course of the above ear infection is extremely interesting, and demonstrates the rapid, deadly work of a virulent streptococcus hemolyticus. From the onset, the course appeared to be that of a very ordinary acute suppurating middle ear, which ran a course of seven days when the temperature became normal, the ear drum appeared to be clearing, and the outline of the malleus had become visible. Suddenly, the temperature began a gradual rise, and within thirty-six hours reached 104.2. The blood count showed 22,000 leucocytes, with 86 per cent polymorphonuclears, signaling, in the absence of other findings and with the extreme temperature, an extensive mastoid involvement with the presence of, or a threatening, dangerous complication.

Another interesting finding was the absence of granulations on the sinus in the region of the abscess, again demonstrating that a perisinus abscess, without granulations on the sinus, is much more to be feared than one with marked granulations, representing a good reaction on the part of nature to the infection.

A striking feature of this case is represented in the temperature curve. Probably no one symptom is more constantly present in a lateral sinus thrombosis than the wide, sharp oscillations of temperature. Yet, this man did not exhibit a single oscillation following the lowering of the temperature after the operation, but, instead, there was a very slow gradual rise, covering a period of two days, to 103°, and death.

*Case 3:* Private R. C., entered the base hospital on October 3, 1918, with a cough and a slight pain in the chest, of three days' duration. The temperature was 104.2, pulse 98, and respiration 26. There were patches of bronchial breathing and moist rales over the chest. A diagnosis of bronchial pneumonia was made. The progress of the disease was favorable, and within seven days the temperature was normal and the lungs rapidly cleared.

The patient was a fairly well developed, well nourished white male, 23 years of age, who had been a telephone lineman prior to his entrance into the service thirty-seven days before coming to the hospital.

On October 14, eleven days after entrance to the hospital, severe pains developed in the right ear, with a temperature of 103. The drum was found to be red and bulging, and a myringotomy was done, opening widely the posterior half of the drum membrane. The temperature immediately dropped to normal, but no pus discharge was noted until twenty-four hours later, when it became thick and profuse.

On October 16, some mastoid tenderness was present, and one week after the onset (October 21) there was edema and tenderness over the mastoid, with beginning sagging of the posterior canal wall. X-ray showed general mastoid involvement. The white blood count showed 16,550 whites, with 67 per cent polymorphonuclears. The urine was negative. A simple mastoidectomy was performed under gas-oxygen anesthesia. The entire mastoid was filled with pus, from which a pure culture of streptococcus hemolyticus was obtained. The lateral sinus was exposed and found covered with granulations for a distance of one inch. Beyond the granulations, the sinus appeared to be normal.

The immediate recovery from the operation was good, and the wound was filling with apparently healthy, firm granulations, when on the eleventh day (November 2) the temperature suddenly rose to 104, with a complaint of severe pain in the abdomen. There was no chill. White count was 23,400; urine negative, and the blood culture was sterile at the end of three days.

During the next few days, the temperature rose each afternoon to 103 and to 103.6, being practically normal each morning. There were no chills, but complaint of some headache and pain in the epigastric region.

On November 7, a blood culture was taken again, which remained sterile. Blood count showed 17,600 whites, with 86 per cent polymorphonuclears.

On November 8, 9 and 10, there was a sharp rise of temperature each day, with a slight chilly sensation, followed by a profuse sweat, but no distinct chill. On November 11, the patient had a definite chill, with a sudden rise of temperature to 104.2. The blood count showed 33,000 whites, with 92 per cent polymorphonuclears. Blood culture taken at this time showed hemolytic streptococcus.

A jugular ligation and section was done, followed by an extirpation of a thrombus extending from the knee of the lateral sinus well down toward the jugular bulb.

The temperature dropped to normal and the general condition of the patient was good. However, on the day following the operation a headache developed, confined largely to the right temporal and also to the right occipital region, and grew so excruciating in character that the patient cried out with pain. The pain in the frontal and temporal region was especially marked, and for twelve days the patient was kept almost constantly under the influence of morphin. During this time, the temperature ranged from normal to 101. The pulse rate varied from 42 to 88, with distinct tendency

to slowness. There was considerable nausea and vomiting, which was never projectile in type. At no time were there any speech disturbances, muscular spasms or paralysis.

Seven days after the jugular resection, an eye examination, which previously had been negative, revealed normal muscular and pupillary reactions, but there were striking changes in the eye grounds. Both discs showed a swelling of five to 6 diopters; the veins were tortuous and there was general evidence of marked artero-venous compression in both eyes. The sight was blurred and the patient could not read his own mail.

The blood count five days after the resection showed 33,600 whites, with 89 per cent polymorphonuclears. Two days later there were 23,400 whites, with 85 per cent polymorphonuclears. The count remained very high and did not become normal until eighteen days later.

Two X-ray examinations, made on November 26 and 27, gave no definite findings of brain involvement.

On November 23, the temperature became normal, the headache practically ceased, the condition of the patient rapidly improved, and excepting for the interference of vision, the patient was as well as any convalescent mastoid could be.

This patient presented some most unusual symptoms and findings. Following the simple mastoid operation on the right side, a lateral sinus thrombosis developed, which reacted beautifully to the operation, from the temperature standpoint. Preceding the operation, the temperature was oscillating between normal and 106. Immediately following the operation, however, the temperature dropped to normal, the general condition was improved and no high temperature followed, indicating that the thrombus had been entirely removed, and that there was no further extension in the remaining sinus.

Twelve hours after the operation, however, the patient developed symptoms for which it has been difficult to account. The headache was severe and well localized to the right side of the head, especially the right frontal and temporal regions. The question arises: Was this headache due to perisinus inflammation, irritating a plexus of nerves in the region of the jugular bulb, which, by connection through the sympathetic with the trigeminal nerve produced the severe temporal pain? In favor of this assumption is the fact that upon moving the gauze plugs in the region of the jugular bulb, three days after the operation, immediate, distinct excruciating pain occurred in the occipital and especially in the right temporal region.

The phenomena was not only demonstrated once, but a number of times, with the same severe pain in the right temporal and frontal regions upon irritating the jugular bulb.

With the severe headache, double choked disc, slow pulse (the slowest count was 42) and vomiting, an abscess of the right temporal lobe seemed most assured. Focalizing symptoms were not present, as might be expected in a right temporal lobe involvement of a right-handed person. Exploration was delayed, and twelve days after the operation the condition of the patient began to improve, and but for the swollen discs and impaired vision the patient appeared to be well. Of course, an abscess could have accounted for the above symptoms, and, having become encapsulated, might remain absolutely without symptoms for many months, or for many years (Neuwerck).

Optic neuritis, or even choked disc, following operation for a lateral sinus is an interesting feature, and the question arises as to whether the neuritis is really due to the obstruction of the vessel or whether it is due to the pressure incidentally exerted against the brain by the rather large amount of packing often firmly packed in the wound to secure hemostasis.

*Case 4:* Private J. P., entered the base hospital on November 30, complaining of a sore throat. The tonsils were read and injected and gave a culture of hemolytic and non-hemolytic streptococci, with the absence of pneumococci. The general examination was negative.

The patient, 21 years of age, a farmer in civil life, entered the service September 1, 1919. There was no history of previous acute infection, except a pneumonia occurring in March, 1918. One month after entering the service, he developed influenza, followed by a broncho-pneumonia, from which he made a good recovery, and then developed measles. He had been out of the hospital only a few days when he returned on November 30, with tonsillitis.

Five days after entrance pain developed in the left ear. A myringotomy was done and a profuse discharge of pus followed, which gave a culture of streptococcus hemolyticus. The infection was a virulent one, and within seven days an acute suppurative mastoiditis had developed with a temperature of 104.

On December 11, seven days after the onset of pain in the ear, a simple mastoidectomy was done. The central cells were yet hyperemic and contained no pus, but considerable pus was present in the zygomatic region and the region of the tip. It was while curetting out the last few cells over the hard plate of the sinus,

down near the tip, that a welling of pus occurred and a perisinus abscess was uncovered at this point. A gray area, about one-half inch long, with few visible granulations, was present in the wall of the sinus, while the surrounding sinus wall, upon wide exposure, was normal in appearance. The wound was flushed with alcohol and packed with iodin gauze. Twelve hours later the patient began to show signs of meningeal irritation. He grew restless, talkative and delirious. The temperature did not rise above 102 until the morning of the thirteenth, when the exposed area of the sinus showed signs of suppuration, and a blood culture taken two days previously showed positive hemolytic streptococcus. The blood count showed 10,600 whites, with 81 per cent polymorphonuclears.

A jugular ligation and section was done on November 13, followed by exposure of the sinus. The thrombosis was found to extend to the confluens sinuum, and a part of the great occipital protuberance had to be cut away in order to get the pressure plugs over normal sinus. Upon turning out the thrombus, no bleeding occurred from the region of the jugular bulb, while free bleeding was obtained from the distal end. The edges of the open sinus were trimmed away, and the wound packed with iodin and plain gauze, followed by a few temporary sutures in the skin flaps.

We were out of gas-oxygen, so ether was used for the anesthetic. The patient was on the table for an hour and twenty-five minutes, and lost considerable blood from the distal end of the sinus; the pulse was imperceptible, and the patient was in shock. Strychnin sulp. 1-30 (hypo) was given and repeated in one hour. Five hundred c.c. of normal saline was given by hypodermoclysis, after an unsuccessful attempt to give it intravenously. The saline (500 c.c.) was repeated in two hours. The foot of the bed was elevated, and heat applied to the extremities. Adrenalin chlorid was given per hypo., 15 m. every five hours for two days, while caffein and sodium benzoate (gr. 2), alternating with strychnin (gr. 1-30) were given every three hours for three days, when the strychnin was reduced to 1-60 gr., and continued as above for three days more.

Glucose (30 per cent) was given (6 to 8 oz.) per mouth every hour in ice water, with a little orange juice, while glucose (30 per cent) was given (4 oz.) per rectum every three hours. Alkaline drink (8 oz.) was given per mouth four times daily. Thus the patient was filled with fluids and kept fairly well alkalinized, reducing the toxicity and preventing acidosis.

During the first two days following the operation, the temperature rose to 105 and 106, delirium was marked and the pulse was

very rapid. The white blood count remained comparatively low—14 to 17,000, with a high per cent of polymorphonuclears. On the third and fourth day, the delirium began to diminish and the general condition seemed improved. However, metastatic abscesses were forming over the right elbow and the back of the right hand. The left knee was severely painful.

Two weeks after the operation, a pericarditis developed, followed by an acute myocarditis. Later a bronchial pneumonia occurred, followed by a pleural effusion. The patient was in a desperate condition, but made a good recovery, with absorption of the fluid.

No changes in the eye grounds occurred in this case.

The extent of the operation resulted in a very extensive granulating surface, extending from the auricle posteriorly over the great occipital protuberance, but owing to the weakened condition of the heart, following the acute myocarditis, it was not until March 4, 1919, that a plastic operation was performed, with good cosmetic results.

*Case 5:* The following patient, Private T., 26 years of age, entered the base hospital on February 9, 1919, with an acute coryza and cough. He had just returned from oversea and was being examined for discharge, and it was with much bitterness that he came to the hospital while feeling so little indisposed.

His previous and family history was negative; physical examination revealed a white male of moderate physique, and good nourishment, suffering from an acute coryza and tonsillitis, catarrhal in type, and an acute bronchitis. Cultures from the throat gave positive hemolytic streptococci; the temperature remained little above normal, but the patient seemed to be reacting poorly, and ten days later showed some lung involvement, broncho-pneumonia in character.

On February 25, the patient developed pain in the right ear which, upon examination, showed distinct mastoid tenderness and a bulging ear drum. Following an immediate myringotomy a serous-bloody discharge occurred, which soon became purulent in character, and revealed a hemolytic streptococcus infection on culture.

The ear drum remained open, the mastoid tenderness continued, the lung condition did not seem to improve, and on March 1 and 3 the temperature rose to 104. The blood count showed 14,000 whites, with 76 per cent polymorphonuclears. In the presence of the findings of pneumonia we hesitated in operating the mastoid; however,

on the morning of March 5, a simple mastoidectomy was done under gas-oxygen anesthetic. Fearing that the previous high temperature (104) might have been due to a threatening mastoid complication, special care was taken to thoroughly exenterate every portion of the mastoid. The cells contained a moderate amount of pus, with little destruction of bone, and a small area of sinus exposed appeared to be of a normal blue color. The culture taken from the mastoid cells gave a positive hemolytic streptococcus.

On the day following the operation the temperature remained high (103) all day without chills or great discomfort. The urine was negative, the white blood count was 8,100, with 84 per cent polymorphonuclears, and a blood culture taken at this time was reported positive for hemolytic streptococcus two days later. The patient still revealed a patch of broncho-pneumonia over the lower left lobe, which seems to be resolving. The temperature remained high without any sharp oscillations or accompanying chill toward the end of the third day following the simple mastoidectomy, when there occurred a severe chill, followed by a profuse sweat and temperature of 103.8. The white blood count was surprisingly low: 8,000, with 85 per cent polymorphonuclears.

The following morning under gas-oxygen anesthesia the lateral sinus was uncovered, revealing a perisinus abscess of thin liquid yellow pus, over a gray necrotic sinus wall. The internal jugular vein was then ligated and severed (below the common facial vein, which was not uncovered). The lateral sinus was then opened and plugged well above the knee and down toward the bulb with small gauze rolls placed between the bone and sinus wall. There was free bleeding from either end of the open sinus and the thrombosis did not appear to completely occlude the vessel.

The patient left the table in good condition and was immediately put on alkaline drinks, eight ounces every three hours by mouth, and 30 per cent glucose (4 oz.) per rectum, every three hours, in order to combat the general toxemia and septicemia. Sodium benzoate, grs. 2, was alternated every two hours with strychnin, gr. 1-30.

On the day following, the patient had a severe chill, with a temperature of 106.6 and pulse 160. The white blood count showed 37,400 whites, with 90 per cent polymorphonuclears. His condition looked most serious; the temperature, however, gradually dropped to normal within the next three days, and the patient went on to an uneventful recovery.

Examination of the eye grounds before and following the lateral sinus operation showed no pathological changes.

## OTOGENIC FACIAL PARALYSIS.\*

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Paralysis of the facial nerve which arises in the course of an ear disease or which is related directly or indirectly to auditory lesions is described as "otogenic." Most facial paralyses are of peripheral origin. Those of central origin occur chiefly through intra-cranial complications of otogenic diseases. We differentiate complete and incomplete facial paralysis. Incomplete paralysis is better spoken of as a paresis. Facial paralysis may also be classified as inflammatory or traumatic. The inflammatory types arise in the course of acute or chronic middle ear infection associated at times with labyrinthine suppuration or suppuration in the internal auditory meatus which for the most part is attendant upon purulent meningitis. In some cases facial paralysis is in reality part and parcel of a neuritis of the seventh and eighth nerves. It may also occur in certain lymphomatous diseases such as leukemia, pseudo-leukemia, chlorosis and lympho-sarcoma.

Certain malignant tumors either of the brain or arising from the middle ear may cause facial paralysis among other symptoms. This is especially true of acousticus tumors, gliomata and angi-sarcomata, in which normal nerve tissue is replaced by connective tissue. Traumatic cases are caused either by a fracture of the base of the skull extending through the petrous bone, or by some surgical procedure along the course of the seventh nerve.

Temporal lobes abscess may also cause facial paralysis. Abscesses of the cerebellum, if situated near the middle line in the worm, produce facial paralysis by pressure upon the rhomboid fossa.

*Pathology.*—At post mortem one frequently finds pus along and within the nerve sheath and even between the nerve bundles, especially in the region of the geniculate ganglion. In many cases the nerve is surrounded by pus in the facial canal. In other cases the bony facial canal is destroyed either traumatically or by a chronic osteitis. Finally, after destruction of the bony wall, granulations or masses of cholesteatoma cause pressure upon the nerve, resulting in paralysis. Hemorrhage may also occur between the bony canal and the nerve sheath, but if the blood does not penetrate into the nerve tissue itself, there is little interference with the function of the facial nerve.

\*Read before the American Academy of Ophthalmology and Oto-Laryngology at Cleveland, Oct. 17, 1919.

Post-operative facial paralysis, if it occurs immediately after the operation, is the result of extensive bleeding into the nerve itself caused by the chiseling, or in an operative injury of the bony canal resulting in injury of the nerve or complete destruction of it.

Post-operative paralyses, which come on from three to six days after operation and develop gradually, are usually caused by direct infection during the operation and set up an acute neuritis of the seventh nerve, which disappears in a few days or weeks.

The peripheral facial fibres show a high tendency to regenerate. Return to normal is facilitated if the suppurative inflammation in the middle ear and in the nerve sheath is cured. Even in cases of long standing, the outlook for regeneration of the fibres is favorable if the cause is removed.

The most striking symptom of unilateral facial paralysis is a relaxation of the facial muscles on the paralyzed side and a contraction of the muscles on the sound side, bringing about a very unpleasant facial expression.

Through paralysis of the branch supplying the mouth, the angle of the mouth is motionless, the skin of the cheek lacks its normal tension, is relaxed and sunken in, or puffs out during respiration. Paralysis of the frontal branch is followed by loss of voluntary movement of the skin of the forehead. Through paresis of the muscles which close the eyelids, there is more or less lagophthalmus, which, in recent cases, is associated with increased tear-ing. Sometimes, especially in children, the tear-ing ceases and the surface of the bulb becomes dry. Insufficient closure or lack of closure of the lid leads to ulceration of the cornea. In rare cases, an iridocyclitis or panophthalmia may take place. In long standing facial paralyses, those existing from childhood, there is asymmetry of the skull so that on the diseased side the bony skull is poorly developed. If, in a peripheral facial paralysis all branches of the parotid plexus are concerned, then the site of the lesion is in the trunk of the nerve central to the parotid plexus. If the nerve is affected above the origin of the auriculo-temporal nerve and below the chorda tympani, then there exists not only paralysis of the facial musculature, but diminished mobility of the head and neck. If the chorda tympani is also concerned, then there are disturbances of taste and sometimes in the beginning of the paralysis, considerable burning in the affected half of the tongue. Paralysis of the nerve to the stapedius muscles produces bad hearing and subjective noises. If the site of the lesion is in the internal auditory meatus, then there is a disturbance of function in the superficial petrosal nerve. Paralysis of one-half the palate is seen only in exceptional cases.

In central paralysis of the facial, there is never a complete unilateral degeneration of the peripheral distribution of the nerve. Some fibres still function as a rule. Chewing and drinking are difficult. Particles of food collect between the cheek and the teeth, and it is impossible to prevent fluids from running from the paralyzed side of the mouth when swallowing, but the patient very soon learns to overcome this disability, using the finger to press the food toward the sound side, and, when drinking, inclines his head always towards the sound side. At first, whistling and sucking are impossible.

Inflammatory otogenic facial paralyses are usually of infectious origin, and are rarely sudden. Usually this form of paralysis sets in with trifling disturbances in the face; that is, involuntary twitching, transitory disturbances in the mouth or eye, and after a few days, sometimes after one or two weeks, reach their full development.

*Diagnosis.*—In the majority of cases the otogenic character of the facial paralysis is to be determined from the history. This holds true especially for those lesions which take place in the course of acute or chronic middle ear suppuration, but if there is no such history, and if the drum membrane is intact, then it is difficult to differentiate between an otogenic paralysis and one of so-called "rheumatic" origin. The most important point is whether the paralysis developed quickly or slowly. Slow onset speaks for otogenic and rapid onset for "rheumatic" paralysis, barring, of course, the traumatic type.

Central paralysis is also to be recognized if either the upper or lower facial branches are involved, and by the fact that a complete unilateral paralysis never takes place. Finally, in peripheral facial paralyses, the electrical excitability of the peripheral nerves is pathologically changed, but in central paralysis this may be almost normal.

*Prognosis.*—The extent of facial paralysis has no special prognostic significance. In general, it may be said that incomplete paralyses are more favorable than complete, but in otogenic facial paralyses, this is by no means the rule. More important is the rapidity with which the paralysis has arisen. For instance, there are post-operative paralyses which are complete immediately. These are unfavorable cases. The longer the time which elapses from the beginning to the completely developed paralysis, the more favorable is the case. An opinion regarding the prognosis in peripheral paralyses is made possible by the electric test. Cases with retained excitability often show quick and complete healing.

in from three to six weeks. It is seldom that a facial nerve lesion remains unhealed in the presence of retained faradic excitability.

Paralyses with loss of faradic excitability, whether they are partial or complete, are always to be looked upon as unfavorable. Favorable cases show the galvanic reaction increasing in degree during two or three weeks' observation. In these types, less and less current is required at each examination to produce muscular contraction. Unfavorable are those cases in which the electric reaction shows gradually decreasing excitability of the muscles. Also unfavorable are those in which only a trace of the electric reaction is present, and the galvanic excitability especially on the mouth and eyelids is reduced to a minimum.

The time necessary for complete restoration is difficult to determine beforehand. Severe paralysis and loss of faradic excitability, usually require from six to eighteen months, but diminished or incomplete function upon the diseased side in these cases may remain for a long time, even for several years. The function of the facial nerve may not be restored at all, but even then a certain equilibrium is established, and the third nerve of the diseased side or the trigeminus of the sound side compensate for the most annoying disturbances, such as the taking of food and speaking. The remaining uncured cases may be divided into two groups: First, paralyses which persist in the form of marked muscular atony. These are exaggerated in degree by atrophy of the skin of the face and atrophy of the fat in the cheek. Second, paralyses which gradually show marked muscular contraction. Moderate contractures are favorable to a fair cosmetic effect. The normal profile is again seen, and the closure of the lid is better. But, if the contractures increase, there is then a high degree of disturbance, drawing of the angle of the mouth and permanent passive closure of the lid.

*Treatment.*—As an aid to prevent the wounding of the facial nerve during mastoid operations, Dr. Charles E. Perkins has set down certain postulates which are of value to the operator.\*

1. If the nerve is completely severed there will be one, and only one, contraction, which will involve all the muscles supplied by the facial. The anesthetist will be able to see that both the muscles at the angle of the mouth and those around the eye are involved. The paralysis will be permanent.

2. In the second type of case the nerve is injured by the instruments of the surgeon, but not completely severed. The tympanic wall of the fallopian canal is easily removed with the curette. Warn-

\*C. E. Perkins. Annals of Otol., Rhin. & Laryng., September, 1915—664.  
"Facial Contractions During the Radical Mastoid Operation."

ing of such accident is frequently given by facial twitches. There is a partial paralysis which rapidly becomes complete.

3. This is a type where the nerve is bared, occurring usually in the horizontal part of its course, either as a developmental anomaly or because the bone over the nerve has been destroyed by bony degeneration. Twitching may occur from probing or from the pressure of a gauze sponge in the middle ear.

4. Twitching is caused by traction on the chorda tympani.

If the facial paralysis was caused by chronic middle ear suppuration, a radical mastoid operation should be immediately carried out. In these cases facial paralysis is a bad omen. It indicates that as a result of suppurative osteitis or of a gradually increasing or acute suppurative cholesteatoma, the labyrinth and the endo-cranium are in danger. Therefore, we must investigate every case of facial paralysis occurring in the course of a chronic middle ear suppuration very carefully in order to determine the possibility of a labyrinthitis or intra-cranial complication.

Slight facial paralysis with retained faradic excitability, occurring in the course of acute middle ear suppurations, may be treated conservatively if it shows a completely normal course; that is, normal temperature, no pain, no mastoid symptoms, no sinking of the posterior superior canal wall, and a gradual decrease of these symptoms with increasing hearing. But in all other cases, immediate posterior drainage should be undertaken.

If the paralysis has come on after operation, one should immediately change the dressing and look for splinters of bone in the facial canal, or for insufficient drainage of the middle ear. In such a case, the retro-auricular wound should be kept open.

I once did a radical mastoid operation and followed the common practice of inviting the House Surgeon, who assisted me to carry out the post-operative dressing and return the patient to the ward. On the following day when I visited the hospital, the patient showed a marked facial paralysis for the explanation of which there seemed nothing tangible since the greatest care had been exercised in watching the face throughout the operation. Upon removing the dressing, we found that the middle ear had been very firmly packed with gauze, thereby infringing in some way upon the integrity of the facial nerve. It was almost one year before this paralysis cleared up, but the intervening months were filled with many unpleasant moments on the part both of the patient and the operator.

When the facial paralysis occurs concomitant with suppurative labyrinthitis, exenteration of the labyrinth and exposure of the inner auditory meatus should be carried out. If there are, at the

same time, symptoms of suppurative meningitis with post-operative facial paralysis, the most favorable results follow upon opening the facial canal in the middle ear. In traumatic paralyses resulting from wounds or complete division of the nerve and of its bony canal, wide opening of the facial canal may produce a good result if one succeeds in removing all obstacles which have hindered union of the divided nerve ends. Sometimes one can chisel a bony gutter in which the divided nerve ends can be protected.

In mild cases one may use faradic electricity which should be applied daily from five to ten minutes. One should use the strongest current which the patient can bear. If the faradic excitability is gone, then one should use the galvanic current. If galvanic excitability is present, one electrode is applied to the trunk of the nerve below the pinna, and the other electrode to an indifferent point; e. g., hand, breast, neck, etc. One should also galvanize the paralyzed muscles to keep them from atrophying. This electrical treatment may be supplanted by massage of the facial muscles and also by exercises which the patient can carry out before the mirror.

In uncured cases of long standing, surgical treatment only is of avail. An attempt should be made to anastomose the facial with the spinal accessory or the hypoglossal nerves. Or, one may try, through plastic operations, to improve the cosmetic defect and to do away with most of the unpleasant disturbances. There are two methods of anastomoses which may be used.

First: Anastomosis between the facial nerve and the motor branch of the spinal accessory. A slightly curved incision, four or five centimeters in length, is carried from the lower limit of the pinna to the posterior border of the sterno-cleido mastoid. The soft parts are dissected by blunt dissection until one feels the styloid process. Just behind this, one finds the trunk of the facial surrounded by a fairly thick sheath. This is exposed, and with small forceps the nerve is drawn outward until it is put on the stretch. This, in order that one may sever it as high up in the facial canal as possible. The spinal accessory is now exposed and followed upwards to the point of origin of the branch to the deltoid muscle. End to end anastomosis is now performed; that is, the deltoid branch of the spinal accessory is cut through obliquely and the central cut end is united with the peripheral oblique end of the facial by two silk sutures. The use of silk sutures in nerve anastomoses has been recommended by Gluck because it produces a certain inflammatory reaction which is favorable to the quick union of the united nerve ends. If one prefers lateral anastomoses, then the motor branch of the spinal accessory is cut superficially, with the scissors and at

the spot where the neurilemma is removed, a number of the exposed nerve fibres are laid bare and the end of the facial nerve is implanted and held by sutures as in the above method. A thin strip of gauze, isoform or iodoform is carried through the lower angle of the wound and the skin is closed by metal clamps.

Second: Anastomosis between the facial nerve and the hypoglossal nerve. The incision extends from the inferior point of insertion of the pinna about four cm. long toward the hyoid bone. The facial trunk is exposed as in spinal accessory anastomosis. The nerve is now sought for either in the digastric triangle or in the so-called lingual triangle and either a lateral anastomosis after superficial cutting away of the hypoglossal may be made, or an end-to-end union after severing the hypoglossal.

A strip of gauze is introduced through the anterior angle of the wound, as far as the anastomosis region, and the skin wound is closed by metal clamps.

The indication for undertaking anastomosis is found in certain cases of facial paralyses if, owing to trauma in the facial canal or in the facial nerve itself, a cure by conservative treatment seems impossible. For example, in cases of fracture in which not merely the nerve is severed but a portion of the nerve has been destroyed and where the bony facial canal has suffered severe injury. Likewise, in cases of paralysis through nerve infection where a part of the nerve and of the bony canal is completely destroyed through chronic middle ear suppuration or cholesteatoma.

In all cases of facial paralyses the question of *when* is quite as important as the question *how*. In general, when there is loss of faradic excitability and decreasing galvanic excitability of the muscles, negative excitability of the nerve is the indication for anastomosis, if after a trial of six months or a year the conservative treatment has brought about no favorable changes and no functional improvement. If the facial parysis exists longer than two years, then we have no reason to expect any improvement from anastomosis. Within two years the nerve has usually completely degenerated throughout its entire length so that the annexation of a sound motor nerve is without result.

*Post-Operative Course.*—Since we perform a facial anastomosis only in complete peripheral paralyses, the severing of the paralyzed facial does not produce any symptoms. It will be found that the small remnant of retained function in the region of the eyelid or angle of the mouth is preserved after central division of the facial trunk. This fact proves that these remnants are not to be

ascribed to the paralyzed facial. They are the result of vicarious contribution of functions from branches of the motor trigeminus of the same side, or facial nerve of the sound side. If the results from anastomosis by the end-to-end method are good there is often a shoulder paralysis on the side of the operation when the spinal accessory nerve is used, and a unilateral tongue paralysis when the hypoglossal nerve is used. These paralytic disturbances disappear in from eight to twelve months. Sometimes, however, they remain permanently. In any event degeneration in the facial must not have advanced too far. In favorable cases the first sign of improvement takes place in from six to twelve months; rarely in a shorter time. Under regularly continued galvanization, the patients first notice spontaneous improvement in chewing and drinking. They finally learn to whistle and to suck. An ideal result is only exceptionally possible as regards the cosmetic appearance of the face. Involuntary play of the facial muscles takes place in cases of facial-accessory anastomosis when the shoulder is moved, and in cases of facial-hypoglossal anastomosis simultaneous with movements of the tongue. Whether the "cured" patients ever show complete innervation of the facial again is questionable. Theoretically more is to be hoped for in facial-hypoglossal anastomoses because the cortical area of the hypoglossal is placed very near to the cortical area of the facial. On the contrary, the cortical area of the facial is fairly remote from that of the accessory, so that in facial-accessory anastomoses, in spite of the cure of the face itself, permanent associated movements of the shoulder are to be expected.

Gersuny has attempted to correct the facial deformity by a plastic method applied to the muscles. He recommends a suture of silk or silver wire introduced from within the mouth to prevent contracture of the angle of the mouth. The suture remains from four to six weeks and is said to work favorably in contractures of moderate severity.

In cases of chronic relaxed paralyses or high-grade contractures in the region of the eyelids, a plastic operation is indicated. These operations are described in various text books dealing with the eye. It must be mentioned that high-grade muscle contractures represent the worst form of permanent facial paralyses. In such cases regular galvanization of the muscles should be carried out continually for several years once or twice weekly and should last for about ten minutes at each sitting. Massage, hot air baths and diaphoresis should be administered whenever indicated.

## CONCERNING THE EFFECT OF REPEATED ROTATION UPON NYSTAGMUS.\*

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The recent discussion of the effect that continued and repeated rotation has upon the ocular movements known as nystagmus may be summarized in a few words.<sup>1</sup> A disagreement has arisen out of the assumption that nystagmus is a simple and unchangeable reflex, isolated more or less completely from other responses to rotation. The history of the subject suggests that this doctrine is based less upon a broad scrutiny of all the facts—anatomical, physiological and mental—than upon a naive application of physics to certain problems in medicine. For example, Jones<sup>2</sup> states: "Ear stimulation causes a pulling of the eyes; this is easily understood as a simple reflex . . . this reflex exists by itself." The conception of the physiological fixity of the nystagmus is of importance to otologists, for it is the basis of most of their clinical tests, and particularly of the tests used in determining the vestibular normality of prospective aviators. Because of this assumption the ocular effects of rotation have been regarded in some quarters as physiologically fixed. In spite of this fixity, however, otologists working at the Mineola laboratory found that under certain conditions, "nystagmus occurs less in duration after repeated turnings and that the sensation of vertigo becomes less."<sup>3</sup>

The distinction drawn by the otologists between nystagmus and vertigo is chiefly verbal. It leads them into the awkward position of trying to demonstrate that nystagmus cannot decrease, while vertigo, past-pointing, falling, and all the other organic effects decrease and even disappear under practice.

In their criticism of an earlier investigation Fisher and Babcock<sup>4</sup> admit that a slight decrease may take place in a few observers; but they hasten to explain the decrease by supposing it to be a temporary effect of "fatigue" or of the "voluntary gaze-fixing" of an occasional observer. In the experimental work done by the otologists only one rotation (ten turns) appears to have been given each day with six observers, and but twice a day with four observers. The decrease thus found is, therefore, all the more striking. It suggests that the nystagmus is much more sensitive to practice than had been previously demonstrated. The authors are genuinely

\*From the Psychological Laboratory, University of Illinois.

troubled by any decrease whatsoever. In discussing the possibility, Fisher and Babcock say: "This point of view" (which they are combatting) "may be summed up briefly as follows: a reflex reaction may disappear as a result of frequent repetition; this disappearance need not necessarily indicate a pathological condition. Clinical medicine has for years relied on the permanency and constancy of reflex phenomena. Medical men have come to place a great reliance on the appearance or non-appearance of the knee-jerk, the elbow-jerk, and the pupillary, Babinski, and other reflexes. The assumption, therefore, that one may develop a tolerance and eventually fail to exhibit a reflex simply as a result of turning is so contrary to the medical conception of the behavior of reflexes in general that it naturally became a subject of investigation at the Medical Research Laboratory at Mineola, L. I."

But the use of "fatigue" as an explanatory principle cannot be seriously urged, since several days at the least may elapse between periods of rotation without obliterating the decrease. Fisher and Babcock themselves admit that the lapse of a day, when a subject might be expected to recover at least partially from his "fatigue," has no effect upon the findings. The appeal to "fatigue," therefore, is fanciful. In the case of "gaze-fixing" the otologists sought to save themselves by placing "plus 20-degree plano-convex lenses" before the eyes of their subjects, thus—as they wrongly contend—eliminating fixation. They overlooked two things, however. In the first place, strong lenses do not eliminate all fixation, for objects still appear with blurred outlines. In the second place, the use of lenses increases, *per se*, the time of nystagmus. Fisher and Babcock observed the nystagmus both behind as well as through the lenses. Their laxity of method is demonstrated by their failure to note that it is impossible to observe the eyes *through* the lenses without bringing the head or a part of the face to tolerably clear vision for the subject. And observations made behind such lenses are inaccurate at best. The writer has found that when the average initial nystagmus time for a group of subjects is, under usual conditions, about twenty-five seconds, these same individuals will give an average nystagmus time of forty seconds or more when lenses are placed before their eyes. It is surprising that the authors quoted should not have taken account of this fact.

To carry on a series of turnings and then to use lenses serves but to conceal, therefore, any real decrease that may have taken place up to that time.

Finally, there is no evidence to show that any series was carried on long enough after the use of the lenses to demonstrate the presence or absence of further decrease.

So far then, no reliable evidence has been offered to show that the decrease found is not a genuine decrease. On the other hand, experiments reported from the Psychological Department at Mineola do show conclusively that decrease in nystagmus is the inevitable effect of continued rotation, and that in some cases all ocular movement subsequent to the turning disappears.

As a last resort the otologists retreated to medical grounds and declared that where any decrease takes place the subjects must be "pathologic." For example, they contended that at least two of the subjects used by the psychologists were "pathologic," but Dunlap<sup>5</sup> has successfully disposed of this absurd defense. If the authors had given due regard to psychological method they would have seen the futility of their appeal to the question of fixation.

In order to make it abundantly clear, however, that the time of nystagmus does not decrease because a few subjects learn the trick of "gaze-fixing," the writer carried out a series of rotation experiments with a group of white rats. The whole series included approximately 20,000 rotations. The conditions maintained during these experiments approximated those used for human subjects. Furthermore, the optimal conditions of non-fixation as sought by otologists are found in the rat, inasmuch as this form lacks distant vision as well as the organic means of fixation. The results of these experiments are summarized in the following table, which gives the average duration in seconds of the after-nystagmus in all ten subjects:

Rotation Period No.	To the left	To the right
1	5.57	5.64
2	4.83	4.78
3	4.11	4.10
4	3.63	3.50
5	3.36	3.31
6	2.38	2.48
7	2.10	2.31
8	1.77	1.73
9	1.59	1.52
10	1.20	1.26
11	1.05	1.11
12	.98	.97
13	.82	.84
14	.73	.75
15	.58	.62
16	.44	.40
17	.27	.31
18	.00	.00

The fact of decrease is incontestable. In spite of the impossibility of "gaze-fixing" every one of the ten rats wholly lost its ocular movements after rotation of from ten to eighteen rotation periods. Other facts issuing from these experiments are:

- (a) The decrease is so constant as to show within any single day.
- (b) The decrease in the time of nystagmus is paralleled by a decline of such other effects of rotation as retching, and as movements of the head.
- (c) The appearance and the disappearance of nystagmus are closely associated with all the other effects of rotation.

Here then we have still more evidence of the fact that nystagmus is not a fixed response, but that it is a variable and easily modified constituent of a large group of mental and organic effects of rotation.

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## LARYNGOLOGY AND RHINOLOGY WITH THE AMERICAN EXPEDITIONARY FORCES IN FRANCE.\*

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In a retrospect of the work accomplished during the latter months of the war when the specialties with especial reference to the upper respiratory passages should have reached a comparatively high state of development and efficiency, it is with no small sense of disappointment that one mentally reviews the conditions that were to all intents and purposes universally met with in France during that period. The writer was stationed at Mesves sur Loire, one of the largest American hospital centres abroad with actual accommodations for twenty thousand patients including the convalescent camp. The centre was composed of ten base hospitals each with the capacity of two thousand beds including the crisis expansion. The individual base hospital units were complete entities with their own operating rooms, laboratories, X-ray departments, etc., and were understood to be in a position to properly treat any case that might come under their care. As a consequence, during the early days of the centre, no differentiation was made, but only at a later date were certain units designated to care for special cases, thus contagious diseases to one, influenza and pneumonia to another, orthopedic and fractures to another, etc., but I do not recall anyone designated for nose and throat cases. It is true that a unit did set aside one or two wards for head cases, but these were more particularly mouth and jaw injuries and were under the supervision of a dentist and oral surgeon. Each hospital unit was equipped with a field set for nose, throat and ear cases and was supposed to have one room solely for this work, but as this specialty was never encouraged, this room was seldom in evidence. Despite these discouragements, certain laryngologists endeavored to organize their departments, but on account of the apathy of those in command, together with the inefficiency of the medical supplies, and the lack of adequate lighting and water supply, the result was rather crude and totally inadequate for even the proper examination of the patients. Small wonder is it then that little encouragement was held out to patients requiring the use of the nasal or laryngeal speculum.

\*Read before the Philadelphia Laryngological Society, Nov. 4, 1919.

ACTUAL CONDITIONS ENCOUNTERED DURING THE GREAT INFUX OF  
PATIENTS FROM THE MEUSE—ARGONNE OFFENSIVE.

This time is chosen as it was the greatest and most comprehensive effort of the United States to turn the tide of battle and as a consequence was fraught with great casualties; but was worth the price as it was this drive that definitely overcame the military superiority of the Germans and caused them to lay down their arms.

Train loads of sick and wounded arrived with such frequency that the capacity of the centre was soon taxed to its utmost, all available bed space being occupied. The character of the cases was rather curious. One would naturally suppose that those suffering with wounds would be in the preponderance, while, as a matter of fact, the sick, shell shocked and gassed constituted about fifty per cent of the total, at least so far as our centre was concerned. Of these the most interesting, laryngologically speaking, were those that had been gassed, not considering the very exceptional throat wound cases. These gas cases were placed on the medical side and treated by the internist with occasional examination and advice from the staff laryngologist. (It must be remembered that the laryngologist was detailed as a ward surgeon and had little opportunity to devote time to his specialty.)

The symptoms in these gassed patients depended upon the concentration of the gas and the length of time it was inhaled. Like the severe wounds of the throat, those badly gassed were sent to hospitals near the front so as to avoid any transportation that was not absolutely necessary. As a consequence, we received only those cases that could be called moderate. On admission these patients were usually ambulatory, stating they had been exposed to the fumes of mustard gas but did not appear to be suffering nor did they, as a rule, complain greatly. They were at once placed in bed and not permitted to smoke, although most of them had already desisted as the tobacco seemed to have a peculiarly unpleasant taste. This was one of the earlier symptoms of gas poisoning. After three or four days, the cough became more distressing and the laryngeal mucosa affected which manifested itself by various degrees of hoarseness to complete aphonia. While, of course, this was due to the direct irritation of the gas, nevertheless, in my experience the psychological element entered largely into the aphonia. Inspection at this stage revealed an intense hyperaemia of the faucial structures which extended down into the larynx, the cords being red, thickened and relaxed. The parts

were exquisitely sensitive and were difficult to cocaine, making the examination more or less tedious. Local treatment seemed to have little influence on the affection and in five or six weeks it had usually ameliorated to such an extent that the patient could be sent back to his organization.

The grave form of gas poisoning was a much more serious proposition. Only one case of this character came under my observation and in a German prisoner; a more distressing example of suffering I have never seen. The dyspnoea was marked and accompanied by a persistent cough which continued during the night and was very difficult to control. Expectoration was scanty, thick and sometimes streaked with blood; the voice had completely disappeared.

It was difficult to make an inspection, partly on account of the condition of the patient but mostly on account of the lack of facilities where he was confined. It was, however, plain that the entire mucosa of the upper respiratory tract, with the exception of the nasal, was intensely inflamed, red, swollen and covered with a grayish, dirty exudate. The inter-laryngeal structures (arytenoids, ary-epiglottic folds and ventricular bands) oedematous as far as could be seen. This condition gradually improved until at the end of eight weeks the patient had recovered from the distressing symptoms leaving a very sensitive respiratory tract with a persistent cough and hoarseness.

#### WOUNDS OF THE THROAT INVOLVING THE PHARYNX AND LARYNX.

These were exceedingly rare in the hospital centres at some distance from the line of battle as most of the cases of this nature were classed as urgent and sent to hospitals situated in the immediate vicinity of where the injury was received. The actual number of cases in comparison to other injuries was small, due to the protection which the chin offered, and, in the event of being wounded, to the fatalities from injuries to the great vessels in the neck.

*Pharynx.*—These were rare but occasionally when a missile of low penetrating power entered the neck and happened to avoid the great vessels, it either wounded or found lodgment in the pharynx. When this occurred from a high explosive shell or shrapnel the injury was more or less extensive and correspondingly dangerous due to the certainty of infection and to the probable extention to vital structures. Machine gun bullets, on the contrary, could cause a penetrating wound of the neck traversing the pharynx, followed by prompt healing and little discomfort to the patient.

It was really astonishing the slight inconvenience that some of these through and through wounds of the neck caused, especially when their location was taken into consideration.

*Larynx.*—Wounds involving the internal structure of the larynx were seldom seen due in a large measure to the natural protection afforded by the chin, as well as the mobility of the larynx itself; moreover, it must be remembered such injuries, when received, were rarely confined to the larynx but frequently embraced the great vessels of the neck in their destructiveness with almost immediate fatal consequences. Such wounds if received from the front were apparently most frequently due to high explosives, while those from the side shrapnel and machine gun fire and rifle fire. By far the most frequent appearing at the hospital were caused by machine gun bullets. The relative infrequency of any sort of wound involving the larynx can be judged by the reports of Guisez, who found 17 in 726, and Scheier 7 in 2500.

*Symptoms.*—One of the earliest and most common symptoms of a throat wound involving the larynx is dyspnoea. This is due to a number of causes including (a) the missile acting as an obstructing foreign body; (b) obstruction from the injured structures; (c) paralysis of the laryngeal muscles, and (d) the appearance of oedema. Hemorrhage is constant and frequently serious in character, due of course, to the rich blood supply of the larynx and the numerous and important vessels in its immediate vicinity.

*Treatment.*—Almost every case of this character, sooner or later, required a tracheotomy. Indeed many more patients would undoubtedly have been saved had an early tracheotomy been performed. Should dyspnoea not occur immediately after reception of the injury, the possibility of its appearing later is by no means precluded and should be confidently anticipated. The swelling and oedema plays the most important role in this connection and the patient should be closely watched on this account. Immediate and secondary hemorrhage caused serious concern on account of its peculiar fatality. In many instances, the cartilaginous portions of the larynx were so shattered that it was difficult to find the bleeding points; these were the type of cases in which secondary hemorrhage so often occurred.

After the first phase of the treatment is completed, that is, when danger to life has passed and it is assured that the patient will survive, the attention should be directed to the conservation of the laryngeal tissues. The objects of this are to prevent subsequent stenosis, to preserve as much of the voice as possible and for

cosmetic effects. This is accomplished by plastic resections and is largely in the province of general surgery.

#### NON-SURGICAL AFFECTIONS OF THE PHARYNX AND LARYNX

##### PECULIAR TO WAR CONDITIONS.

Excluding those conditions produced by the irritating gases (chlorine mustard and sneezing), it cannot be properly said that any conditions peculiarly incident to war conditions were observed. The various commoner affections such as choriza, sore throat, etc., were present as in civil life, but as the men became more inured to life in the open, they were much less frequently met with. There is no question that the men complained much less of nose and throat conditions than they did in the camps and cantonments in the States. The care and attention that these men received at home from the specialists before they were sent abroad was, without doubt, responsible for this happy state of affairs and I am proud to state that the results of the throat surgery practiced upon these men were almost unexceptionally without reproach.

#### THE EPIDEMIC OF INFLUENZA IN RELATION TO THE NOSE AND THROAT.

Everyone recalls the marked predilection for the respiratory tract shown by the causitive factor of the influenza during the late epidemic and with what intensity and rapidity the pulmonary structures were involved. One would naturally suppose that the upper respiratory tract, particularly the nasal sinuses, would have shared in the involvement at least in a more or less attenuated form. Previous epidemics have always been followed by a certain amount of sinus disease, therefore, everyone was on the lookout for the first symptom of this complication and being particularly interested, I was especially alert. I can now state that among the many hundred cases which I personally saw, not one gave the slightest symptom pointing towards the nasal sinuses. On inquiry among the other hospitals I found the same condition prevailing. Whether this will appear at a later date as a signoee remains to be seen.

Acute angina was also the exception rather than the rule even among those who contracted pneumonia. The larynx and trachea were not involved in the ordinary cases and seldom among the pneumonics. This was substantiated not only by laryngoscopic examinations but in the cases that ended fatally by autopsy.

As a resume, it can be said that the great epidemic of influenza, at least in southern France, showed very little predilection for the mucosa of the upper respiratory tract.

1928 Chestnut St.

## ITALIAN CONTRIBUTIONS TO THE STUDY OF THE ETIOLOGY AND THERAPY OF OZENA.

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There seems to be in Italian rhinological literature a scarcity of reference to foreign contributions. Probably this is due to linguistic difficulties. The writer deems it a useful work to obtain a more intimate scientific collaboration between American and Italian rhinological literature, and therefore desires to take up a consideration of the old but as yet unsolved subject of Ozena.

*Etiology of Ozena.*—Various theories have been invoked to explain the origin of this obscure disease, the characteristic of which is the well-known symptomatic triad; foul smell, yellow-greenish crusts, and atrophy of the nasal mucous membrane and of the turbinal. For clarity of exposition we shall classify the various Italian publications dealing with the etiology of ozena into several classes: (1) theories on constitutional ozena; (2) theories on neurotrophic changes; (3) bacteriological theories.

(1) The Neopolitan rhinologist, Cozzolino, thought that ozena was due in the first instance to be a scrofulous condition causing nutritional changes of the nasal tissues, and in the second instance it was due to bacteriological action.

Masini and Genta made a study of the blood in ozena and found that there was present a relative decrease in the red blood cells and an increase in the white blood cells.

As ozena occurs frequently in tubercular subjects and families, Gradenigo considers it as a paratubercular disease.

Caldera studied the intradermic tuberculin reaction in sixty cases of ozena and in only fourteen (in about 23 per cent of the cases) did he obtain a positive result. Bilancioni obtained positive results with a tuberculin reaction in 34 per cent of the cases studied.

(2) The neurotrophic theory is sustained in Italy by Ferreri, who holds that ozena is the result of a change in the nerve supply of the nose with a production of dystrophic and finally atrophic changes in the nasal mucous membrane.

(3) The bacterial theory among various others has had the greatest vogue in Italy. In 1878 Masini of Naples expressed the generic opinion of a bacterial origin of ozena. In 1893, after a description of the bacillus mucosus by Abel and Lowenberg, Strazza

communicated the results of his studies on twenty-five cases of ozena, and described as constantly present a capsulated, gram-negative, non-motile bacterium showing a tendency to greater colorization at the poles than in the body and growing easily on the ordinary nutritive media. This bacterium was constantly present. In 1896 Pes and Gradenigo isolated from ozenous crusts a little bacillus, slightly chromophile, gram-negative, which was pathogenic for experimental animals, varying, however, in individual cases. In the same year Belfanti and Della Vedova published results of their investigations on sixty-three cases of ozena. In every case they found the bacillus mucosis and also a pseudo-diphtheria bacillus. Gradenigo also found this micro-organism in ozena with great frequency, and in 1899 Cozzolino published an interesting bacteriological study of forty-two cases in which the Abel-Lowenberg bacillus was constantly present, whereas the pseudo-diphtheria bacillus was present in twenty-eight cases. The latter appeared but little resistant to the action of dilute antiseptics and was easily deprived of its pathogenic activity to experimental animals. The bacillus mucosis, however, was very resistant to antiseptics used in the dilutions normally tolerated by mucous membranes. Therefore, Cozzolino considered the bacillus mucosis as possessed of a definite pathogenic action in ozena, but he denied the importance of the pseudo-diphtheria bacillus.

Marano's observations published in 1890 confirmed the constant presence of the Abel-Lowenberg bacillus in cases of ozena, but without conclusion as to its specific pathogenic action. In 1896 De Simoni confirmed experimentally the constant presence of the bacillus mucosis and the frequency of the pseudo-diphtheria bacillus in ozena. In 1897, the same author published negative results of experimental inoculations of ozena in several tuberculous and scrofulous subjects, using the cultures of germs isolated from secretions and ozena crusts. He felt that in addition to the microbic-organism there was needed a peculiar predisposition on the part of the nasal mucous membrane. Della Vedova, in a work published in 1899, criticized De Simoni's experiment and pointed out that the period between the day of inoculation and the time of noting the results was too short. In 1900 De Simoni communicated another series of bacteriological researches in which he pointed out the existence of three classes of bacillus mucosis which, under varying cultural conditions, would lose their individual characteristics. The author thought that the three classes were derived from a common type, namely, the Friedlander bacillus.

In 1906 Sforza and Rizzuti isolated from ozenous crusts a very motile, gram-negative, thin bacterium, that was able to grow also under anaerobic conditions. Inoculation with this germ was pathogenic for rabbits, mice, and guinea pigs, but in the nose of the dog it gave no result.

It was in 1899 that Perez described his *coccobacillus foetidus ozena* as the specific cause of the malady, having obtained, by inoculations of the cultures into the rabbit's veins, an atrophy of the turbinals.

In 1903 Tanturri of Naples published an interesting monograph, in which he claimed to have found in many cases of ozena the bacillus mucosis isolated with the *coccobacillus foetidus* of Perez. The author renewed the experiment of Perez, inoculating the cultures into the veins of rabbits, without, however, obtaining any appreciable result as regards atrophy of the turbinals, or any other nasal change. Under basis of accurate bacteriological researches, the author concluded that the *coccobacillus foetidus* and the *bacillus coli* are identical organisms.

In 1914 Caldera repeated the experiment with intravenous inoculations of *coccobacillus* cultures in rabbits, but was unable to observe atrophy of the turbinals or other changes in the tissues of the nose. The author carried out also the serodiagnostic reaction in many cases of ozena, the antigen used being a suspension in physiological salt solution of a solid culture of *coccobacillus*. In no case did he obtain a complement-fixation, and he therefore concluded that the *coccobacillus* produced no action on the organism.

In 1911 the same author, in collaboration with Gaggia, carried out similar researches, but using as antigen the watery and alcoholic extracts of ozenous crusts; but with this method also he got negative results. Caldera also made a study of the intradermatic reaction with old, broth cultures of *coccobacillus*, sterilized by heat or through filters, and in none of the ozena cases did he get a positive result. He admits the frequency in ozena of the *bacillus mucosis*, having found it in thirty-three out of thirty-five cases, but he denies its specific action, as it is not possible to reproduce experimentally with it the clinical symptomatology. From his clinical statistics studies the author believes that ozena is not a contagious disease; the bacteriological factor would have an importance in the production of the foul odor, but the malady itself would depend upon peculiar organic conditions, such as the lymphatic diathesis.

In 1918 Lasagna of Parma repeated the experiments of Perez on rabbits. He made five series of investigations. In the first group he used intravenous injections; in the second group he made submucous injections in the nose; in the third group he plugged the nose with gauze soaked in microbic culture, after having first cauterized the nasal mucous membrane; in the fourth group he injected an emulsion of ozenous crusts under the mucous membrane; in the fifth group of experiments he used a monkey as the experimental animal. The results were negative and the author denies the specific action of the coccobacillus foetidus and the infectious nature of the disease. In 1918 Torrini published an experimental confirmation of the preceding negative results, having used intravenous injections of coccobacillus cultures in young rabbits.

*Therapy of Ozena.*—No disease perhaps has had proposed so many methods of treatment as ozena, but we are obliged to admit that not one of them has had perfectly successful results.

In 1881 Morra recommended as anti-ozenous remedies boric acid, aseptol, thymol, resorcin, and menthol. In 1882 Origene, Masini, and Massei advised the intranasal use of a one-half per cent solution of resorcin, followed by the application of a three per cent resorcin ointment. Gradenigo advised the use of iodin and of oxygenized water. Fasano used, since 1883, tampons soaked in a solution of aristol in collodium. In 1886 Malacrida employed with good results tampons annointed with essential oil of turpentine. In 1892 Masucci and Felici reported good results with vibratory massage, and in 1902 Colombo published a paper advising this method. In 1896 Cozzolino advised the surgical treatment of ozena with scraping of the nasal mucous membrane, followed by antiseptic dry treatment.

In 1896 and in the years immediately following, after the observations of Belfani and Della Vedova as regards the pseudo-diphtherial bacillus in ozena secretions, serotherapy with antidiphtheritic serum was employed by Della Vedova, Gradenigo, Catterina, Arslan, Masini, Poli, Strazza, Ferreri, Ambrosini, and Cagnola. The apparently good results obtained by some of these rhinologists were however, purely transitory. In fact, Cozzolino criticized this method of treatment and reiterated his opinion as to the non-bacteriological etiology of ozena.

In 1897 Masini described the treatment of ozena with electric cataphoresis. In the same year Ferreri advised the application of creosote diluted in alcohol and glycerin to the nasal mucous mem-

brane, after first thoroughly cleaning out the nose. Faraci obtained successful results with this method.

In 1901 Montodo De Francesco published the first case of rapid and permanent recovery from ozena following an accidental infection with erysipelas.

In 1902 Dionisio of Turin proposed a new treatment of ozena, based on the action of luminous radiations. In 1912 he confirmed the good results of his method, having used it on one hundred cases. In 1903 he reported the first results obtained by submucous injections of warm paraffin in ozena. For this operation he devised a special syringe which had the property of maintaining the paraffin in a warm and liquid condition. In 1904 Guarnaccia advised injections of paraffin vaseline with the fusion point at 45°C., previous sterilization at 100°C. In 1905 Hahn, of Turin, and in 1909 De Palma obtained advantageous results by means of the high frequency current. In the same year, Bobone advised the local use of petroleum with oil of eucalyptus and strychnine. Masini, on the other hand, preferred treatment with naphthalized petroleum. In 1905 Brugnatelli published an article in which he praised the use of oxygenized water and of a three per cent solution of lactic acid. In 1913 Hahn and Malan of Turin claimed to have obtained good results with the method of respiratory re-education proposed by Robert Foy. In 1913-14 Gradenigo, Caldera, and Moretti obtained some successes in ozena cases by inhalations of saline, dry fog of Salsomoggiore water produced with the Stefani and Gradenigo inhaler. In 1914, Bilancioni advised the use of nasal tampons soaked in a saturated solution of iodoform and sulphuric ether. In the same year Caldera reported encouraging results obtained with submucous injections of paraffin, made with a special syringe filled with paraffin, fusible at 52°C., and treated with sulphuric ether to keep it soft. (The method was published in 1911.) In 1916, Caldera recommended, as a very active deodorizing method, plugging the nose anteriorly for half an hour every day with gauze soaked in ox bile sterilized at 100°C., or in three per cent watery solution of sodium taurocolate. This treatment is an adjuvant to the favorable results of paraffin therapy.

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## ABSTRACT.

### CEREBRAL ABSCESS OF FRONTAL SINUS ORIGIN.\*

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Abscess of the frontal lobe of the brain complicating a frontal sinus suppuration is a rather uncommon occurrence. Nevertheless, this complication arises more frequently than was supposed about twenty years ago. In 1896, Drefuss collected nineteen cases of frontal sinusitis accompanied by intracranial complications. In 1908, the same author was able to increase this figure to eighty-eight, and of this number thirty-six were abscesses of the frontal lobe. In 1909, Gerber found in the literature sixty cases of such abscesses mentioned. In 1914, Boenninghaus collected in the literature a total of eighty-seven cases of frontal lobe abscesses complicating frontal sinusitis.

All authors emphasize the fact that the symptoms of frontal lobe abscess are not very distinctive, and hence the diagnosis is generally very difficult. In his exhaustive work, "Die Komplikationen der Stirnhöhlen Entzündung," Gerber makes the statement that the most frequent feature of abscess of the frontal lobe is the absence of symptoms. As regards otitic abscesses, diagnosis has, in recent years, made considerable advance since Barany has proved that there exists in the cerebellum centers which govern the movements of the joints in the different main directions, and that paralysis or irritation in these centers may be clinically ascertained by means of the pointing tests. The conditions as regards frontal lobe abscesses are different. In these cases, as a rule, no focal symptoms are to be found. Such symptoms do not appear until the abscess has become very large and begins to extend in a backward direction. Thus, in certain cases, focal paralysis, strabismus, and motor and amnesic aphasia have been described. In general, in making the diagnosis, one must be content with the etiology of the cases combined with the more or less distinct signs of intracranial pressure. In this way the diagnosis has, in many cases, been successfully made. But this nearly always demands considerable time for observation. Often the mode of procedure is to operate in the first place for the sinusitis. The symptoms fail to disappear; they may even increase in severity. Gradually it becomes clear that there exists something more than an inflammation in the frontal sinus, and thus finally the

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cerebral abscess is diagnosed. This is so typical that on reading the history of cases of this character, one finds these conditions recurring again and again, almost with the regularity of a law.

As to the symptoms: Headache is of course a symptom that is very common in the most dissimilar forms of illness. This symptom might, therefore, be considered as being of little importance in support of the diagnosis. Especially is it risky to attach too much weight to headache as a symptom, because it is present in the original disease, the frontal sinusitis. Notwithstanding this, however, it is of considerable value, not on account of its localization, for that is not a characteristic feature, but what frequently distinguishes this headache is its severity.

Practically speaking, the question whether an existing sinusitis has led to an intracranial complication, now hardly ever arises before the pus in the frontal sinus has been evacuated. If violent headache exists afterwards, it points to an intracranial complication. The nature of that complication is, no doubt, often difficult to decide with certainty. However, the intracranial complication that most frequently arises in connection with frontal sinusitis is cerebral abscess. Besides, in meningitis and in thrombo-phlebitis of the longitudinal and cavernous sinus, we have other symptoms which are of more or less decisive importance for differential diagnosis. And, finally, as regards epidural abscess, this abscess, especially when it has attained certain dimensions, may give rise to symptoms similar to those of cerebral abscess and result in diagnostic confusion. It must, however, be remembered that epidural abscess as an independent condition is of rare occurrence. Besides, there is no doubt that the very severe headache and serious general condition should lead us to suspect the presence of cerebral abscess, but the differential diagnosis between these two maladies is not of great importance, as the situation will become clear under operation.

While, as stated above, considerable diagnostic significance may be attached to an intense headache, it must not, on the other hand, be forgotten that the headache may not be a very prominent symptom. This may be the case if the abscess is small or if it has secured an outlet through a fistula.

Another important, but unfortunately far from constant, symptom in connection with cerebral abscess is the slow pulse. This symptom enjoys, to use the expression, an altogether too unqualified respect. Thus, Macewen in his classical work mentions slow pulse as an important diagnostic symptom, without making any re-

ervations. On the other hand, Oppenheim draws attention to the fact that there are individuals whose pulse habitually is 60 or below. Furthermore, it must be borne in mind that a slow pulse may have its origin in conditions that belong to a different category. Without enumerating the various possibilities the following case may be mentioned: Total resection was performed on a 9-year-old girl for an uncomplicated chronic otitis on the right side. Two weeks after the operation she began to complain a little of headache; she had attacks of vomiting, and in the course of a few days her pulse went down from 80 to 60. She did not, however, give the impression of being very ill. Some days after the appearance of these symptoms there developed an icterus, which accounted for the slow pulse and the other phenomena.

Considering the fact that the frequency of the pulse among healthy people may vary within fairly wide limits, it is exceedingly important to be able to follow the variations of the pulse of patients with frontal sinusitis during a fairly long period of time. While the occurrence on a single occasion of a comparatively slow pulse is not a very reliable symptom, we are, on the other hand, entitled to attach importance to decreasing pulse frequency, often if the slowness of the pulse, absolutely regarded, is not very conspicuous. In order to ascertain a slight decrease in the frequency of the pulse, it is of course necessary to have the patient under observation for some time, and during that time constantly to note the pulse rate several times every day. With patients suffering from frontal sinusitis as well as inflammations of the other accessory sinuses, where the symptoms are so serious that an important operation is demanded, during the whole of the treatment note the pulse rate, even if there is no suspicion of intracranial complications, for the reason that such a pulse record may be of value later on.

In cerebral abscess the pulse may be either normal or rapid, and it may also be varying.

The condition of the pulse also has a certain significance in the diagnosis. After the operation one can generally note an increase in the pulse frequency, but even if the pulse remains slow for some time after the operation the patient may nevertheless recover, as in Rische's case, where during the five days immediately following the operation the pulse was down to 48, and in Herzfeld's case, where it remained slow (48 to 58) for one week after the operation.

The supposition that the psychic functions are connected with the left frontal lobe and that from the absence or presence of the psy-

chic function we should be able to draw conclusions regarding the seat of the disease is, unfortunately, without solid foundation. It is precisely the unfortunate thing that in abscesses of the frontal lobe focal symptoms are generally lacking. Neither is the occurrence of convulsions anything unusual. Vomiting is a symptom that is generally present and may make its appearance at a comparatively early stage. Vomiting is, to be sure, a very usual symptom in many diseases, and a single attack of vomiting must not, of course, be at once interpreted as a sign of cerebral abscess. On the other hand, we must not under-estimate the importance of this symptom for the diagnosis. We must bear in mind the possibility of the existence of such an abscess when with a patient suffering from frontal sinusitis vomiting occurs, for which no other satisfactory explanation can be found, especially when the vomiting occurs independently of meals. Vertigo is less frequently mentioned in medical literature than vomiting. Of four patients, it occurred in two of them, in one of which the vertigo was very marked.

Other symptoms which occur, but which are of less importance, are stiffness of the back of the neck, incontinence, changes in sensibility and reflexes, and chills. All of these are rare and are not distinctive features.

The temperature offers nothing characteristic. This much may be stated, namely, that considerable rise in temperature does not necessarily form part of the clinical picture of cerebral abscess.

Optic neuritis and stasis of the papilla are symptoms pointing in a positive direction when there is a question of intracranial complication in connection with frontal sinusitis. On the other hand, there are still other symptoms referring to the eye. Swelling of the eyelids was found in all of the four patients. One patient developed an abscess of the eyelid. Swelling of the conjunctiva was present in two of the four patients. In one case the chemosis was very pronounced. In one case there was an orbital abscess. Of course these external ocular symptoms in themselves prove nothing as to whether or not there exists a cerebral abscess. Strictly speaking, they only indicate that the inflammation in the frontal sinus threatens to extend or has already extended to the orbit and its contents. But the ocular orbital complications are known to appear comparatively often in those cases of sinusitis, which are accompanied by intracranial complications, and thereby they acquire a certain diagnostic value. While the frequency of ocular complica-

tions in connection with frontal sinusitis may be estimated at 20 per cent, it has been proved that these complications arise far more frequently in connection with abscesses of the frontal lobe, of frontal sinus origin. Thus in Gerber's collection of sixty-four cases they constituted 50 per cent. In the presence of acute external symptoms we must therefore be on our guard for the possibility of cerebral complications.

The condition of the wall of the frontal sinus and of the dura matter can, of course, only be determined with certainty in the course of the operation itself. Microscopic changes in these parts may have a certain importance for the diagnosis. It seems to be a fact that the posterior wall of the frontal sinus is in most cases clearly affected. The importance of the condition in which we find the posterior wall of the frontal sinus and of the dura may be described as follows: When we find morbid changes in these parts this fact strengthens the assumption that a cerebral abscess exists. If no changes can be proved to exist, it is often best to make a halt at the dura, and to watch the development of the situation for a day or two before going further in. But if the symptoms point strongly in the direction of an abscess, we must take measures at once, even if the changes in the dura are of a very uncertain nature.

That the cerebral abscess must be opened is generally agreed. But as to how this should be done, how large the opening ought to be, how we shall deal with the abscess cavity during the operation, and how the after-treatment is to be conducted, on all these points there is a wide difference of opinion.

(1) Where shall we look for the abscess that has been diagnosed? In this respect we are more or less happily situated. Körner has, as is well known in the cases of otogenic cerebral abscesses, laid down the principle that abscess, practically speaking, always lies in the neighborhood of the primary suppurative process in the temporal bone. This law can be extended to abscesses issuing from the frontal sinus. We can with fairly great certainty count upon the cerebral abscess being not far distant from the cerebral wall of the frontal sinus.

(2) In what manner shall we make entry into the abscess? Shall we make a proof puncture through the hole of the dura, or shall we first only make a slit? What instrument shall we use for puncturing? Many authorities warn us against puncture. Others prefer that method of procedure. Those who condemn puncture through the hole of the dura emphasize in addition to the danger of hemor-

rhage the possibility of conveying infection from the meninges into the brain tissue. On the other hand, previous slitting of the dura involves a more extensive interference, and just as great a possibility of conveying infection. The fact is that the ideal method which would enable us to determine with certainty whether or not an abscess existed and at the same time would not expose the patient to any risk whatsoever does not exist. The author is personally of the opinion that the puncture operation involves less risk to the patient than a slitting of the dura, with subsequent exploratory puncture of the brain, whether that is performed with a needle, knife or a Pean forceps. In order to diminish risk of hemorrhage, one can employ a needle that is not too sharp, and which can, therefore, more easily glide past any vessel that might be in the way. The puncture should be done as much as possible in a spot where the dura appears to be healthy.

(3) How far in is it permissible to insert the puncturing instrument? Denker has measured in adults the distance between the foremost pole of the frontal lobe and the foremost horn of the lateral ventricle in a horizontal plane about 2.5 c.m. above the floor of the anterior cerebral pit. The distance is from 2.7 to 3.9 c.m., an average of 3.3 c.m. He therefore asserts that one can go in 2.5 c.m. without risk. If we are moving in a plane that lies only from one to two centimetres above the floor of the cranium, we may go to a depth of four or five centimetres.

(4) The abscess having been found, how is it to be evacuated? Most authorities do so by making a long incision in the dura. Many employ a cross-shaped incision. Still others recommend a small incision. The author's views on this question are as follows: evacuation of the abscess when there is a fistula in the dura may be accomplished by cautiously enlarging the fistula and extending the opening with a Pean forceps. Should the dura be sound he would make an incision of moderate dimensions, 1 to 1.5 c.m. This opening may be held apart by means of a Pean forceps inserted so far that the point just reaches the level of the outer wall of the abscess. When the pus streams out through the opening it ought not to be allowed to run out in a continuous stream. The evacuation should take place in successive relays. In this way, firstly, the change in the intracranial pressure occurs less suddenly. Secondly, it is in some degree probable that by this means we get the walls of the abscess to draw together more concentrically than with a sudden evacuation of the pus, and if this be a fact, the risk of the formation of recesses and pockets is thereby lessened, which is very impor-

tant in avoiding the formation of secondary abscesses. The reason for making the opening in the dura comparatively small is to keep the incision within the area in which there are adhesions between the meninges themselves and between them and the surface of the brain, thereby hoping to limit the possibility of the further extension of the inflammation in the cerebral meninges. The small incision is also preferable in view of the possibility of a prolapsus. We cannot, of course, quite eliminate such a possibility by making the opening small. When the cranial contents increase in size as a result of inflammatory changes, they will force themselves out through any opening, even if it is not large. But with a small incision in the dura, we can, under favorable circumstances, insure that the cerebral matter draws the membranes before it; that we, in other words, get a sort of meningoencephalocele instead of an encephalocele.

To prevent injury to the abscess wall with resulting extension of the inflammation, it is best not to do any wiping or scraping of the abscess cavity, nor any palpation with the finger. Much less should the attempt be made to remove the membrane of the abscess. This ought to be regarded as a natural safeguard, and should be left untouched. Neither should the abscess cavity be syringed, although, if cautiously executed, it may be done without causing damage.

In the opening in the dura, either a drainage tube or a gauze strip should be inserted only far enough to reach the entrance to the abscess cavity itself. In order to secure the best possible chance for a free outflow of the pus, the dressings should be changed frequently. Even the first dressing ought not to lie longer than twenty-four hours, and if there is profuse secretion, and if on changing it is seen that considerable quantities of pus stream out through the incision in the dura, the dressings may be changed two or three times in the day. The dural opening should every time be made to gape apart by means of a Pean forceps, care being taken not to insert it too far in.

As regards the dressings themselves, the author prefers the dry form.

If under the extremely conservative treatment above described, symptoms should arise pointing to retention or secondary abscess, we are then obliged to make an attempt to go deeper in for the purpose of finding and evacuating the new pus focus. Under such circumstances the bronchoscope may be employed, as that instrument has the advantage over the others proposed that we are always able to control with the eye the depth of its insertion.

## AMERICAN LARYNGOLOGICAL ASSOCIATION.

*Proceedings of the Annual Congress held in Atlantic City, N. J.,  
June 16-18, 1919.*

*(Continued from page 742, December, 1919.)*

The experience of last year which Capt. F. G. Blake has so well described shows that the same conditions surrounding streptococcus pneumonia are practically the same as those surrounding erysipelas and puerperal fever, and that one ought not to admit into a ward full of patients with pneumonia or respiratory disease of any kind, a case of streptococcus pneumonia any more than he would think of admitting a puerperal fever case into a ward full of puerperal women.

In these papers, which we have been so fortunate as to have today, we have gone a good step further and gotten down to cases that are on the border line. There is no doubt, I think, that we can all accept Captain Blake's point of view that the case of acute virulent streptococcus disease is the source of danger to everyone with whom it comes in contact in a ward.

I think these papers show quite clearly what our work is to be. We must study the prevalence of a chronic streptococcus carrier. Whether we will find in civil life in times of peace, when things are settled, that the streptococcus carrier during the winter season is as common as it was in the camps or not, is the first thing to find out.

We want to know what is the duration of the disease, whether the associates of the chronic carrier remain healthy or develop disease.

Along the lines which Dr. Dochez has started we can work on the bacteriologic side and try to find out whether the streptococci obtained from these chronic carriers are potentially able to cause epidemics of streptococcus diseases. The whole question of the streptococcus from its bacteriologic standpoint has been most difficult, and, although it has been taken up from time to time to solve special problems, the work has languished frequently and even gone backward from time to time; but I think this work which we have heard today represents an advance that is greater than anything that has happened in recent years.

So long as we were unable to differentiate clearly between different kinds of streptococci, very little progress could be made. The field was too broad, and it was impossible to make progress, but in the last two years the field has been much narrowed.

We know that the streptococcus pyogenes or the hemolytic streptococcus is the cause of the severe infections. The other, nonhemolytic streptococci, we can afford to disregard completely in this respect; that throws out an enormous number of streptococci which need not be further considered in this connection. Then we have a large number of hemolytic streptococci which are found in milk and cheese and bovine mastitis. We have also found methods and good reasons now for excluding those from consideration. They do not seem to be of any importance in human pathology, and that narrows the field very greatly until we have now a hemolytic streptococcus which comes from human sources and which is found in these epidemics and also in the acute and chronic tonsilitis.

These organisms are all we need to study, and Dr. Dochez has shown how it is possible to split them up into four groups which can be further studied. We have got to find out some way of telling whether they are virulent or not, and whether they are pathogenic to human beings. Those are two difficult problems, but, perhaps, they are not insuperable.

Of course, that solution for our difficulty during the war was not possible. We couldn't very well break up our camps and send the men home. It was done, however, in the Civil War, and some regiments of Southern troops were disbanded and sent home because of measles. Now, we have got to work out some more satisfactory solution for taking care of streptococcus cases in a hospital than by refusing to take them in. That it can be done I think is reasonable to believe, and by following out the recommendations which have been read here we will go a long step toward preventing cross infections in hospitals due to streptococcus.

We will have opportunities, I think, in civil life just as well as in the army during the war, to study out these problems—perhaps better opportunities, because we were so swamped with the enormous number of cases that not everything that we wanted to do could be done; but we have at least gotten some general principles to work upon, and in our children's hospitals, and especially in the nose and throat wards, this subject can be followed out. We can trace the natural history of streptococcus infection of the tonsil from month to month and from year to year. If we can find, each of us, a couple of chronic streptococcus carriers, and study them as long as they remain carriers without giving any treatment, we will learn the duration of the disease, and whether secondary cases arise from those primary foci—that is a problem which must be solved before we will know just exactly where we stand, and that can be done much better in our hospitals in time of peace than it could be done during the war.

I think that nothing which has come out of the war has been any better than this work on streptococcus infections. I think that now the field is pretty clear. We know what we are dealing with, we know what the problem is, and there is nothing to prevent us getting together and making a program and working it out through as many years as may be necessary to bring it to some satisfactory solution.

DR. STANTON A. FRIEDBERG (Chicago): One of the readers made the statement that it is pretty well agreed that hemolytic streptococci are not very often found in the throat in the absence of epidemics. My experience in the examination of tonsils, while I was engaged in some focal infection work, showed that quite a number of tonsils, perhaps 60 per cent, contained hemolytic streptococci in their depths.

We are handicapped, of course, to a great extent by the fact that we have not the same possibility of obtaining aid in regard to the virulence of the organism that we have in the case of other carrier diseases. The laboratory work is progressing along this line, and no doubt before long it will be of considerable aid in solving this factor.

While at Camp Doniphan we had a rather extensive diphtheria carrier epidemic. We discovered that in every instance of a chronic carrier there was an underlying pathology condition at fault. When this was corrected the carrier condition disappeared.

Emphasis has been made particularly upon the condition in the tonsils. We found that there were other sources responsible for the dissemination of infection, and that led to a more careful examination of the nose. There are quite a number of cases where sinus disease is just as potent a factor in dissemination. In these cases the tonsils may be removed, but the condition will go on just the same. I think if we follow along the lines that we have found to be efficient in other carrier problems we are going to progress from a clinical standpoint. We will have to do this until we can get more clinical aid from the laboratory.

From a clinical standpoint, when we find a chronic carrier with a pathologic process present, even though we are not able to determine the virulence of the organism, we are justified in correcting the pathologic condition.

**THE PRESIDENT:** We have a distinguished visitor, who has done a great deal of work in straightening out bacteriologic problems, Dr. Swift. We will be glad to hear from Dr. Homer F. Swift.

**DR. HOMER F. SWIFT (New York):** We have not touched upon the other broad field of the nonhemolytic streptococcus and their relation to focal infection, a much more difficult field probably than the one we have heard discussed this morning.

The conditions of the war have brought out this other phase of the problem, hemolytic streptococcus, and you can readily see from the discussion this morning in what an early stage of the problem we are at present, and I think it is well to keep in mind the relation of our present state of knowledge to the total solution of the problem.

We are now probably going back to a more or less peace-time basis, and the relation of the carrier to the general problem will be that of a peace-time basis. In the subject of chronic carriers, such as diphtheria and meningococcus, the experience in the Expeditionary Forces, not only in our own but in the British Army, show that the simple determination of carriers by the laboratory was not the whole problem in controlling the spread of disease, and that is the part of the problem that I think we ought to bear in mind—that the average medical officer was liable to cast all of the responsibility up to the laboratory man in controlling the spread of infection. If there was an outbreak of diphtheria or one or two cases, he would think that the determination of a carrier in his company was sufficient to stop the spread of that infection.

We finally came to the conclusion that the examination of the throat twice a day, the use of the stick of wood in depressing the tongue and looking at the throat, was as important a factor in stopping the spread of infection as was the mere culturing the throat, and I think that that just brings up the problem that the clinician, the man who is examining the throat every day, is going to help as much—maybe not as much in adding new knowledge, but in the practical control, as much as any other person.

**SIR ST. CLAIR THOMSON (London, England):** This is the most interesting paper that I remember to have listened to since I heard Metchnikoff speak on phagocytosis. I am not in a position to judge it, but it strikes me that it may be true of what Carlyle said of nations. He said "that no nation which thought itself doing a great deed was doing a great deed; that the great deeds were done by people who were not aware of it."

And this symposium which we have listened to this morning, I think, without exaggeration, may turn out epoch-marking, immensely so.

I think, sir, although, as I say, I am not able to appraise the value of the paper, but I think I am able to appraise the temper in which it has been produced, and that is the thoroughly scientific spirit. The few points that I wished to ask about have been entirely settled by Captain Blake's summary, which shows the difficulties which, as I say, is the true scientific spirit. I hope this symposium will go forth to those who are able to appraise its value. It is of interest to me as focusing once more our attention on the mouth.

DR. NORVAL H. PIERCE (Chicago) spoke to the query occurring in one of the papers of the symposium: "Is the chronic carrier dangerous to himself?" After returning to private practice I selected approximately twenty-five patients who had been referred for advice as to the justifiability of removing their tonsils. These patients lived under the best conditions and suffered from myositis, arthritis or neuritis to a greater or less degree. Some complained of occasional slight soreness in the throat; others did not. Some exhibited peritonsillar fibrosis, others did not; some hyperemia of the anterior and posterior pillars, others not. Cultures were taken from the tonsils of all these cases for a period extending over a month or six weeks, at intervals of several days. In taking a culture the tonsils were everted, the juice expelled by pressure and the platinum needle passed down to the bottom of the crypts. Every culture yielded a hemolytic streptococcus. In this regard the cases could not be differentiated. However, they could be divided into two classes. In one class, and that the majority, were the patients with normal temperature. In a second class, a minority (and this is the point I wish to register), were the cases which exhibited a subfebrile temperature and a leucocytosis constantly or at intervals. In a certain percentage of the latter class it was found that by careful irrigation, massage and disinfection with nitrate of silver of the crypts of the tonsils, the temperature and leucocytosis returned to normal. If an interval of time was allowed to elapse without the employment of these procedures the temperature and leucocytosis returned to disappear when the procedures were resumed. This would seem to prove that some chronic streptococcus carriers are demonstrably dangerous to themselves. It also is a point in aiding us to intelligently differentiate the tonsils which should or should not be removed.

DR. D. BRYSON DELAVAN (New York): The disinfection of carriers has engaged my attention for the past two years very earnestly. I cannot go into the scientific side—that is far beyond most of us and must be left to the gentlemen who have been working the matter out—but there are one or two practical points which seem to me to need a little clearer understanding.

At the Willard Parker Hospital I understand that all diphtheria carriers, children, have their tonsils removed. Now, in my own experience, and in two words, I can illustrate what I want to say: the tonsil is not by any means the only focus of infection. Here is a series of twelve cases of diphtheria carriers. In all, treatment has been carried out. They were all adults, all young women, nurses, had been treated with waters and various gargles of disinfectant character, and all had remained with

positive cultures. Under the use of the dichloramin-T chlorcosane solution, applied after the nasal cavities, upper pharynx and the tonsil had been thoroughly prepared, as I have already described before the association, and the surfaces cleansed of secretion, the cultures in these cases became and remained negative in three cases after one treatment, in two cases after two treatments, in four cases after three treatments, in two cases after four treatments, and in one case after eight treatments, and in not one case did the tonsils have to be removed. There was no tonsillectomy in any one of these cases.

Of course, as Dr. Friedberg has told you, where the lymphoid adenoid, either of the tonsil or upper pharynx, or any part of the lymphoid circle of the throat are invaded deeply, they must of necessity be removed, but in the ordinary case I think the treatment without removal will reach a large number of cases. At least it is worth while to apply that treatment to test it, and not to remove the tonsils in every case, but to use the treatment for a few trials and if unsuccessful then operate.

DR. T. PASSMORE BEEENS (New York): I asked Dr. Bryan just now whether he was including the tonsil exclusively, and he tells me not by any means, that all of the upper air tract is subject to become infected and become chronic or acute carriers, and, of course, I agree with this statement.

DR. JOSEPH L. GOODALE (Boston): In making this introduction of the silver nitrate, I think we should avoid trauma or anything simulating a direct wound of the crypts. We should endeavor to go in and out again with the least damage to the parts possible. We should not apply the treatment in the stage when the individual is still making his antitoxin, but only after he may be conceived to have manufactured all which he is capable of in that particular attack.

In Dr. Bryan's reply or in the reply of the other reporters, I should be glad if they will give us a statement regarding the desirability of excising tonsils during the epidemic; whether the cases destined for tonsillectomy should be kept under any special mode of treatment, whether they use general or local anesthesia, and whether the use of a general anesthetic in those conditions is in their opinion detrimental.

In the first place, during the stage when in the system there is proceeding the formation of antitoxin, we should do nothing in the way of sterilizing or endeavoring to sterilize the tonsils, because the natural process through which the system throws off the disease is the formation of toxin which stimulates the formation of antibodies, thus rendering the tissues less favorable for the further growth of the nitro-organisms.

On the other hand, I think that we find a certain condition where silver nitrate has been of very great value, and that is after suffering with debility and perhaps occasional exacerbations of his fever. If we find under those circumstances certain of these crypts which are more or less occluded and which contain white puriform material, and if we apply silver nitrate or if we are able to enter the crypts and inject gently into them through a canula some silver-nitrate solution, I believe that the individual in the majority of cases will promptly experience a distinct sensation of relief.

Col. Russell and I have had a few discussions, most of them friendly, bearing on the nose and throat topics. I was very much interested in the

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recommendations which were quietly slipped in, at his suggestion, I think, at the end of one of the papers. I think I can make these recommendations, from the standpoint of the oto-laryngologist, a little more crisp. In other words, I should say, "No recruit should enter the army with an abnormal nose or throat." If a recruit is found in the army with an abnormal nose or throat, both, if possible, should be made normal. Every case of acute tonsillitis should be isolated, in spite of the difficulty of bringing this about. None of these three things, and I for one consider them essential, were fully accomplished during the war just ended.

DR. GREENFIELD SLUDER (St. Louis): A question simply: Was any observation carried out upon the lingual tonsil? It seems to me that these observations have all referred to the faucial tonsils.

DR. JOSEPH H. BRYAN (Washington, closing): Mr. President, it was not our intention to maintain that the tonsils were alone the carrier, but the tonsil evidently is the principal source of infection. The upper air passages may become involved secondarily from any ascending infection, just as the pneumonia is a descending infection. Now, after the tonsils are enucleated and the fauces are perfectly normal, there may be still infectious conditions in the nasal pharynx, or in the sinuses, but I believe that those cases are generally of a secondary nature and will clear up under local treatment.

In regard to the lingual tonsil, I don't believe that we carried that out, but if there has been any secondary involvement of the lingual tonsil after the faucial tonsil had been removed and the cultures had been made, there would have been evidence of a positive culture from that region.

With regard to the enucleation of the tonsil during the height of the epidemic, the object is to get rid of this source of infection, provided, other conditions being equal, it is necessary to remove the tonsil even in the height of an epidemic.

In regard to the use of the anesthesia, we removed the tonsils both under general and local anesthesia. Personally, my preference is for general anesthesia, other conditions being favorable and there is no acute condition, no acute inflammation of the upper respiratory tract or any heart or kidney involvement. The enucleation of the tonsils under local anesthesia has many advantages, and I think, many disadvantages, particularly when you have a hemorrhage.

DR. HENRY J. NICHOLS (U. S. N., closing): In regard to the importance of the tonsil as a focus of infection, I feel a little responsible for committing Dr. Bryan to that, possibly because I made a number of cultures of different areas of the nose and throat, including both sides of the nose, the saliva and as many different areas as we could pick out, and always the tonsil gave the strongest culture; then when those tonsils were removed the rest of the area became free of streptococci. Along the line of Col. Russell's suggestion that the laryngologists take up some of these problems, I think that if some of the laryngologists would find it convenient to study cases who had had their tonsils properly removed, some light would be thrown on this subject from the point of view of the carrier problem. And my impression is that you will find few carriers among such cases. You will find carriers among men who have had their tonsils improperly removed, as a very small shred of tonsil tissue apparently can continue to carry the organisms. It would seem that this subject could

readily be cleared up by follow up observations after tonsillectomy in carriers of streptococcus hemolyticus.

My experience has been that it is rare to find streptococci in the upper air passages, outside of the tonsils and immediate neighborhood.

I would like to say one other thing of a sort of general nature—that those of us who are working from a laboratory point of view sometimes get a one-sided view of our own importance, simply because we don't always go along hand in hand with the clinical workers as we should. In the recent laboratory period of the study of syphilis it got to be so that the practical question of the treatment of the patient would be referred to a laboratory man who did not know about the patient as a human organism rather than to a clinician who ought to know all about him. While I appreciated the invitation to meet the clinician, I think also that the society should be congratulated that Dr. Bryan had tried to develop the laboratory and the clinical side of this problem hand in hand instead of one pushing the other. We laboratory men like to think that we take the initiative in things and lead the clinicians in the way they should go; at times, perhaps we do, but that is a one-sided view of things. We have to work hand in hand, and it seems to me very important that this society of practical laryngologists has taken enough interest to want to be the leaders rather than to be forced along later on.

MAJOR ALPHONSE R. DOCHEZ (U. S. N., closing): I should like to draw attention to one point in which our knowledge is still very defective, and on which I think it is most important that statistics should be collected. You may remember that some years ago Smillie studied the incidence of hemolytic streptococcus in normal throats, and his report showed that it is present in approximately 1 per cent of cases. These cultures presumably were made by swabbing the throat or the tonsils, and it seems important at the present time to determine whether these statistics would be materially varied if careful cultures were made from the tonsils, preferably making cultures from the deep portions of the tonsil. This would show us whether the incidence of hemolytic streptococcus in normal individuals, when cultures are made simply by swabbing the throat, is materially less than when these cultures are made from the deeper parts of the tonsil.

The cultures, of course, from the tonsil should preferably be made from individuals who have relatively normal tonsils.

CAPTAIN FRANCIS G. BLAKE (U. S. N., closing): As I remarked in my paper, it seemed to me that the clear indication is for the complete isolation of the acute carrier, and I am very glad to hear Dr. Goodale's remark that the ordinary case of tonsilitis should be absolutely isolated. I think that should be considered as essential as the isolation of cases of more severe streptococcus infection.

**The Extraction of Foreign Bodies From the Deep Portions of the Face by the Natural Route. MAJOR LA MAITRE, Paris, France. (By Invitation.)**

I shall speak very briefly of the removal of foreign bodies from the maxillopterygoid fossa. I removed, I do not recall the exact number, but about forty-two or forty-three foreign bodies from the maxillopterygoid fossa. I adopt a special technic, which is quite different from the technic which is usually used. Generally it is through the skin route. After

having made an incision of the skin the foreign body is removed, and I may show you, among many others, one case in which a general surgeon had tried to remove the foreign body in that way. This makes an incision, which is always disfiguring. It must also be borne in mind that here the facial nerve, the psychopathic process and the ascending ramus necessitate a long and difficult operation.

Instead of passing through the skin, I tried (and succeeded) in every case to operate through the mucous membrane through the vestibulum of the mouth, by the natural route. For instance, in the case you have seen the photo of (and here is the radiograph) it was very easy to remove the foreign body that a good surgeon might also be able to remove by the classic external route.

Regarding the technic: The incision is made in about the same manner as an incision made when we wish to open the maxillary sinus, but this incision is a little back of that. This enables us to reach a region which is between the ascending ramus, which is outside, and the maxillary sinus, which is inside, through this canal; the mucous membrane of course being incised, it is possible to go very far, very deep, and remove the foreign body.

The help of the radiograph is very important, and it can be used in three different ways: First, the classical radiography, which gives an idea of the location of the foreign body and enables one to choose the route and, in that case, choose the natural way. I think it is very important to put a probe in the mouth at the place where we intend to open the mucous membrane in order to have an understanding of the location of the foreign body and to enter the mucous membranes with the probe instead of through the skin incision.

But more important than that is the advantageous manner in which we may work in co-operation with the radiographer. It is not always the same radiographer. I worked with one man during three months, one time, and I must remark on the great difference in the way we were able to work together at the beginning than at the end of the time. At the beginning it is very difficult to do this kind of work.

When the mucous membrane is open I put a forceps at the place in which I presume the foreign body exists, and at the time I ask the radiographer to tell me at what place the forceps are in contact with the foreign body. He would tell me, for instance, half a centimeter below or half a centimeter above, and I change my forceps accordingly. Sometimes I myself am able to discover where the foreign body is. Sometimes it is not possible and the foreign body is grasped by the help of the radiographer.

In some cases I was obliged to go through the sinus itself. If the sinus is involved, it is better to follow the route that the foreign body itself has followed, but generally, except in cases where the frontal sinus is involved, I prefer to go outside the sinus.

Sometimes the foreign body is very deeply seated, very close to the lateral wall of the pharynx, and it is very difficult to remove it because the external area of the subpterygoid fossa is like a wall between the foreign body and the forceps. In that case it is possible (and I have done it) to remove the foreign body by excision of the external area, which is a difficult way to approach the foreign body.

Now, about the danger of this operation. I may say that there is no danger at all. I have had no hemorrhage during or after operation. I had also some annoyance about the muscles, and I may state that on the first day there was a certain degree of muscular tremor, but this tremor disappeared in a few days, and I may say that sometimes the operation enabled me to overcome some adhesions and in some cases to suppress some tremors which existed before the operation.

In conclusion, it is my firm conviction that the operation through the pterygoid fossa, in the same way that the maxillary sinus is, is in the province of the laryngologist and neurologist because the best surgeons for that work are those we have.

#### DISCUSSION.

DR. H. P. MOSHER (Boston): I was exceedingly interested in the paper of Professor La Maitre because in 1915, when I served a short time with the British, I had a few of these cases and extracted the foreign body by the only route then known to me—the external route—and my troubles were many. I am very much interested in the route he describes, and if it should become my fortune to have any cases of this kind in the future I shall certainly resort to it. I do not quite see the advantage to be gained, however, in cases of ankylosis of the jaw by working through the mouth. It seems to me that a pretty wide incision is necessary in many of these cases in order to get all the bone out that you should. For the present, although I would like to follow Professor La Maitre, I think I shall stick to the external route.

DR. N. H. PIERCE (Chicago): I have had the pleasure of being in the same beautiful city as Dr. Le Maitre through some months, and I availed myself of the opportunity of seeing him operate on these cases. I have also had the misfortune of attempting to remove some of these foreign bodies that apparently were rather easy to extract and been very much disappointed. The one thing that struck me with especial force was the necessity of having a trained fluoroscopist to work along with you. Of course the observer uses his instrument while you are working and watches the approach or the divergence, as it may occur, during the operation. One cannot lay too much stress on the importance of this method in the removal of foreign bodies in the depths of tissue anywhere in the body, and especially in the face and neck.

Unfortunately, at our head hospital we did not get our fluoroscope until we became a well organized general hospital, but we had the opportunity of using this method, after a while, and we were very greatly aided in discovering these bodies largely in the deeper regions of the face. It is a very important addition to our procedure of extracting the foreign bodies. For one, I congratulate Dr. Le Maitre for the advancement he has made along these lines.

THE PRESIDENT: At Bellevue Hospital, with which I am connected, we get a great many gunshot wounds, perhaps ten or twelve a year, which formerly, before the Head Surgery was established, were taken care of by the General Surgeon, but latterly they have preferred that we take care of them, and they have been most bothersome. They are pistol wounds usually, attempted homicide or murder, and they have given us considerable trouble. We have usually tried the external route, and it has been puzzling. We have not in our operating room the facilities for working

with the fluoroscopic screen, so it has been a puzzle many times to get these foreign bodies out. We have succeeded usually pretty well, but at the expense of considerable time, loss of blood and not always with the saving of the patient in bad cases. I recall one case where one of my surgeons was operating for an hour and a half on a bullet that had lodged in the pterygomaxillary fossa, who thought he could get it by the external route. Finally the house surgeon put his finger in the patient's mouth, after the surgeon had been operating an hour and a half, and there was the bullet right under the mucous membrane and easily shelled out from a large hematoma surrounding it. It would have been much easier to have located that with the fluoroscope. The radiograph did not show exactly where it was, but if we had had a fluoroscope and a probe it would have simplified matters very much.

**An Unusual and Interesting Case of Nasal Syphilis.** DR. CHARLES W. RICHARDSON, Washington.

The speaker reported a case of a rather unusual type of syphilitic infection of the mucocutaneous border: A woman of 50, otherwise healthy, presenting nothing of interest in her family or previous history, developed a catarrh of nearly six months' duration, when a small growth developed issuing from the left nasal orifice. This manifested itself in June, 1918. When seen by Dr. Richardson in January, 1919, it was quite a large mass protruding from the nose to near the border of the upper lip. It was nodulated, grayish white in color. Perforation of septum in cartilaginous portion; necrosis of lower portion of inferior turbinate; scar on soft palate. Diagnosis: Condylomata, syphilitic. Wassermann made immediately with double positive result. Salvarsan administered, with the usual rapid result and disappearance of growth. Dr. Richardson insists upon holding these patients under treatment until full cure is obtained.

DISCUSSION.

DR. J. P. CLARK (Boston): I have seen a good many cases of syphilis of the nose, and these three points I want to especially emphasize. It is not recognized by the general practitioner. The lesion is usually very late in appearing, and it occurs often in cases where there is no history of previous manifestation of syphilis. I have made some notes of a number of cases of syphills of the nose which I have seen, but I will read only a few notes of the last case that I saw illustrating these points. A man, H. P. R., 41 years of age, married in 1903. He has a girl 14 years old and a boy 9 years old. He gave a history of having a cold last July. I saw him in October, 1918. He said his nose had troubled him since, stopping up at night. His physician had been treating him for hay fever all through the summer, but without any benefit to the symptoms. He had a purulent discharge from the nose. There was a symmetrically rounded swelling, about five centimeters in diameter, at the upper central part of the forehead (gumma). Tenderness on pressure over this tumor and at the root of nose. Patient weighed 119 pounds. There was a marked swelling of the septum, almost obstructing right nostril. Mucous membrane very red, with small ulcers on septum, dry crusts in both nostrils. A Wassermann test was weakly positive. He was referred for general syphilitic treatment and was seen again in April, 1918, and weighed 129½ pounds, had good color, and all local signs of syphilis had disappeared. There was no history whatever of the primary lesion. He

had been a student in Paris before he was married, in the early 1900's (he was married in 1903), and had been exposed, but had never had any lesions of syphilis.

**Delayed Secondary Haemorrhage Complicating Tonsillectomy.** DR. VIRGINIUS DABNEY, Washington.

Secondary hemorrhage is comparatively rare, and one occurring ten days after operation is especially so. The writer presents four cases of secondary hemorrhage delayed beyond twenty-four hours after operation for the removal of faucial tonsils. Two of these were under local anesthesia, without adrenalin, and were tonsillectomies; the others were under ether and the cold snare.

The first case was that of a girl of 18, operated under local anesthesia, hemorrhage occurring on the second day. Ice placed and held firmly in the fossa checked the bleeding.

The second case, also local anesthesia, free bleeding during operation, secondary hemorrhage six hours later. Ten days later, free bleeding while patient was walking in the street.

The third case was operated upon by another surgeon one week previously, and there had been much difficulty in arresting the flow of blood at the time of operation. He remained in hospital five days, with no bleeding. Two days later he was awakened by a sensation of strangling and his mouth full of blood. The flow was so persistent and profuse, and the throat exceedingly irritable, so that all measures used failed to control the flow more than for a few minutes at a time. The patient was brought to the hospital and anesthetized with great difficulty, as he was vomiting blood freely. A jagged tear in the middle third of the posterior pillar was found, clamped, and the hemorrhage ceased.

The fourth case was done under ether and snare, this being the second operation on the tonsils, and more than usually difficult. Six days after operation there was bleeding, with a clot in the fossa. Removal of clot and packing of soft gauze sponge, which was allowed to remain twenty-four hours, stopped the bleeding. A few moments later bleeding recurred and packing was again required, with no free bleeding.

No cause can be definitely stated for these delayed hemorrhages. He assumes that the explanation may lie in the separation of a slough, which if it involves vessels, may cause a hemorrhage on the slightest exertion.

He concludes with the following words:

"The further I travel along the road of laryngology the more sensitive I become to tonsillar hemorrhage, the greater becomes my respect for bleeding areas in the denuded fossa. This confession bespeaks, I hope, rather caution than timidity and that wisdom which is said to come with age. I hope I am the safer man thereby; certainly the patient is."

**The Disinfection of Carriers.** DR. D. BRYSON DELAVAN, New York.

Of twelve diphtheria carriers, every case yielded to our treatment. Four had suffered undoubted attacks of diphtheria, the rest had not. All had been under treatment for periods varying from two months to three weeks, the treatment consisting of the use of various disinfectant solutions sprayed into the nose and throat and used as mouth washes or gargles. In all it had been ineffective. Under the use of dichloramin-T chlorcosane solution, applied after the nasal cavities, the upper pharynx

and the tonsils had been thoroughly prepared by the preliminary application of adrenalin and thus thoroughly exposed and the surfaces then cleansed of secretion, the cultures became and remained negative.

Failing at success after a reasonable number of treatments, redundant lymphoid tissue should be removed.

From observations already made on this subject, it would appear that not all varieties of germs show a predilection for the same localities of the upper air passages. Thus the Klebs-Loeffler bacillus, the meningococcus and possibly others seem to show a willingness if not a preference for the invasion of the upper nasal region. While the streptococcus, whatever may be its wanderings in the otonatal realms, appears to elect the tonsil as its chief center of action. The removal of a tonsil thoroughly and deeply infected with the streptococcus becomes, therefore, a matter of necessity, while, on the other hand, the mere removal of tonsillar tissue in any of the twelve cases of diphtheria quoted above would have been useless.

Whether the tonsils require removal or not, the presence of bacteria in the upper nasal region is sufficient in itself to constitute the subject a carrier, and a carrier he will remain as long as the nasal region remains infected. The proper cleansing and dilation of this area, together with the efficient application of the disinfectant, does not require an excessive amount of time, and it can be carried out by anyone possessed of a reasonable measure of skill and common sense.

**Some Considerations Upon the Present Status of the Etiology and Treatment of Cancer, with a Report of Four Cases of Cancer of the Larynx Successfully Treated with Radium. DR. D. BRYSON DELAVAN, New York.**

Without the knowledge of its causes and basal activities, the study of the means for its local relief are, as for many years past, disappointing. But, while many able men are engaged in this quest under the best conditions that intelligence and generous outlay can afford, their efforts are largely unco-ordinated with each other and, in some cases at least, they are narrow and overtheoretical. Any day some great discovery may relieve us of the present deadly situation. Meanwhile that event might possibly be hastened by the selection of the men best qualified for investigative work, by the elimination of the unproductive and by a better harmony and concert of action among investigators.

Turning back to a consideration of the means of relief now at our command, there are several which relate to the general care of the patient and which not seldom escape the attention of the physician or surgeon in charge. Among these may be mentioned the effect of increased blood pressure upon the development and stimulation of cell growth, the proper selection of food elements as affecting the blood pressure and the chemistry of the body, the effect of certain drugs or of methods of general treatment upon the disease, and the possible influence of the nervous system in connection with it.

The general care of the patient, both before and after treatment, must be carefully studied and more regard than is usually exercised must be paid to the period of convalescence and to that complete recovery from the effects of operation which can only be attained after much longer periods of time than many surgeons are accustomed to allow. Surely

some conditions exist which influence the development and growth of cancer. These should be investigated and understood.

The four cases recorded are:

1. Carcinoma of the larynx. Female, aged 30; first seen in 1916. The superficial growth was removed under suspension laryngoscopy. On March 24, 1917, the growth had much developed. Radium was applied. The disease involved the whole interior of the larynx and the anterior wall of the esophagus. Laryngectomy performed June 7, 1917. Two years later, still wearing a tracheotomy tube, no recurrence. Has acquired a voice of remarkable clearness and carrying power.

2. Male, aged 64; carcinoma of the larynx extending to the left side of the base of the tongue and to the pharynx. Owing to urgent dyspnea, tracheotomy was at once performed.

Because of the extensive involvement, operation was not advised.

On May 23 three tubes of radium 9.8 m.c. were embedded in the growth for 132 hours. On June 26 one tube 4.9 m.c. was embedded for the same length of time.

July 21, radium treatment resumed; pack placed over the left side of the neck. All activity of the growth seems to have ceased.

3. Male, aged 62; radium treatment in August, 1918, with radical extirpation of the larynx on January 22, 1919. In June, 1919, the result was in every way excellent, the patient making slow but satisfactory progress in the control of his voice.

4. Male, aged 80. On September 15, 1918, 880 m. c. filtered through two small m. m. of lead were applied on each side.

Complete retrogression promptly followed this treatment, so that on October 25, 1918, no evidence of disease was present.

#### DISCUSSION.

DR. D. C. GREENE (Boston): The results of radium treatment have been in certain cases so beneficial that we are impressed with the fact that there is something in it, even though in the great majority the results have not been satisfactory.

One serious obstacle to the success of the treatment is the difficulty of making accurate and constant application of the rays to the exact location desired. We have found that tracheotomy is an essential preliminary.

At the Huntington Hospital radium rays were applied by the method of Curie of Paris, who, as you know, was the first to preserve the emanations in containers holding measured amounts corresponding to given weights of radium. By this means the rays are largely conserved and much wastage is avoided.

Dr. Duane of the Huntington Hospital has prepared containers in the form of small glass seeds which may be inserted and left in the substance of the tumor. Several such seeds containing small measured doses, inserted into different parts of the tumor mass by means of a trocar, provide a crossfire, so to speak, between the various points of insertion and increase the effectiveness of a given dose.

Under suspension, with general anesthesia, such insertions can be accurately made in many cases.

When containers are thus applied without screening, it is essential to avoid placing them within 6 or 7 m. m. of normal tissue, otherwise there is risk of ulceration into normal tissue with possibly disastrous results.

For example, a heavy dose of radium thus placed in the vicinity of a large vessel may result in ulceration of the vessel wall with fatal hemorrhage, an accident which occurred in a case which I recently saw.

The post-operative treatment with radium, described by Dr. Delavan, is, I believe, a most important adjuvant to operative cure.

THE PRESIDENT: I think there is no question that radium can destroy, does destroy in certain cases, every vestige of malignant manifestation, wherever it may be. I think it is a question of dosage and is due that and a difficult dosage to manage.

Too large a dose results in destruction, not only of the involved area, but of much of the healthy tissue around it, and in certain regions, as, for example, in the neck, in the larynx, is very apt to be followed by disastrous results. These results do not manifest themselves always early, but manifest themselves months and years after its application.

In a case of epithelioma of the larynx which I have referred to here once or twice, an elderly man who refused operation, the dosage was given on the outside of the neck, with marked recession in the laryngeal appearance, but with some thickening. And a year later, to satisfy ourselves what that thickening was, we removed a piece of it and submitted it to the same pathologist, who reported there was still epithelioma present, and it remained in that condition of thickening; more radium was applied; there was still some thickening.

The man a year after the second radium was applied, which was two and a half years after the radium was first applied, had a sloughing of all of the tissues in the anterior part of the neck; the trachea was completely ulcerated through, so that the lower end of the trachea simply stood up in his neck there.

I think it is unwise and unsafe to introduce into the larynx any radium emanation tube without first performing a tracheotomy. If you examine those cases where we have put any in the nose, I think you will see that the amount of swelling which must occur in the larynx, as it does in the nose or in the tonsils or tongue, is such as to render the patient very liable to such a stenosis as to need an urgent tracheotomy. I think all those cases should be tracheotomized before the radium is used.

DR. D. B. DELAVAN (New York, closing): I cannot quite accept Dr. Greene's remark with regard to the use of small doses and his objection to the use of large doses. The question depends upon the case.

Now, it is worth while to keep on and to try to find out what is the scientific way of applying it and to apply it in that way, but, after all, that is not the point of my paper.

We want to know—it may be a difficult thing to find out, but we want to know, and we have got to know—what the underlying causes of this condition may be, and until we do, we are entirely in the air; we are acting at cross purposes most of the time, one with the other; we are theorizing, and our patients are dying at the rate of 30,000 a year just in the United States alone.

#### Injuries of the Nose and Throat, Due to Bullet and Shell Wounds.

LIEUT-COL. J. M. INGERSOLL, M. C., Cleveland.

In January, 1918, the Medical Department of the Army converted a modern fireproof hotel at Cape May, N. J., into a hospital, known as the Hospital for Head Surgery.

The first patients in the Oto-Laryngologic Department were received on April 1, 1918. The average number of patients in the department varied between 100 and 150.

The injuries to the nose and accessory sinuses and the surrounding tissues varied greatly, and consisted of all sorts of wounds involving these structures. In many cases the eyes were also involved. Pieces of shrapnel and high explosive shell were found in all portions of the head and neck. Shell fragments were also found in all of the accessory cavities, more frequently in the maxillary sinuses than in any other single place. After removing the foreign bodies plastic operations were done to remedy the defects.

The laryngeal cases in some respects were the most difficult type of cases which we had to treat. The laryngeal cartilages and intralaryngeal structures were more or less extensively destroyed, and adhesions formed, causing laryngeal strictures, which necessitated a tracheotomy. Removal of the foreign bodies and all necrotic tissue around the larynx, with free drainage, resulted in recovery eventually. Dilatation of the constrictions finally established intralaryngeal respiration and enabled us to remove the tracheotomy tube.

Vocal exercise in cases of injury of the jaw, pharynx and larynx were exceedingly beneficial in re-establishing the vocal functions and stimulating the injured muscles.

#### DISCUSSION.

THE PRESIDENT: May I ask Major La Maitre whether in bringing down that flap he simply takes one piece of bone for his nasal bridge, inserting it in the middle line, or does he attempt to take two pieces so as to have a sort of roof there?

MAJOR LA MAITRE (Paris, France): Sometimes I include only one piece of bone, when it is a small defect, but sometimes I have two horizontal flaps which permit in certain cases to have a framework more extensive and to sustain the area at the end of the nose. By this method I obtain a primary union instead of leaving a wound which we have in the case of the Indian method which takes longer to cure.

DR. R. H. SKILLERN (Philadelphia): I want to speak a word about the different degrees of injury that some of these machine gun bullets will cause. During the Argonne offensive I happened to see a number of cases of fresh machine gun wounds of the face and neck, and I was struck particularly with some of them with the slight amount of traumatism that they caused.

I recollect particularly one young boy who, three days after he was wounded, was brought to our center. He was shot through the neck, directly in front of the great vessels, the wound of exit being in the midline posteriorly. How in the world that missed those vessels I cannot see, and yet at the end of three days' time the wound had perfectly healed. There was only a dimple in front. I spoke to him and said: "Son, how do you feel?" He raised himself up off his pillow and began to shake his neck and said: "I feel fine, just a little stiffness, that is all." It was remarkable.

I remember another case of a machine gun bullet that transversed the neck from the side. It seemed to have gone through the esophagus,

posteriorly to the cricoid cartilage. That boy has no disturbance whatever in speech—only a little difficulty in taking nutrition.

There was another case that was extensively talked about that I did not see, where a machine gun bullet had entered the temple and gone through the brain. After two or three weeks of very stormy symptoms he seemed to recover, but recovered with a nasal discharge, and on examining the nose they found some trouble up in the sphenoid region, and on probing around found something hard there, and finally with a pair of forceps extracted the machine gun bullet from the left sphenoid sinus. A most remarkable case, the patient recovering entirely.

DR. GEORGE M. COATES (Philadelphia): Colonel Skillern's discussion reminds me very forcibly of many cases I have seen similar to the ones he has just mentioned. It is really wonderful how often these machine gun bullets and fragments of high explosive shells apparently went through or near vital structures without causing death or permanent injury.

We saw a good many cases in the hospital center at Allerey that reached us anywhere from fifteen to seventy-two hours after the injury. I only recall a few at this moment, but we had a number of injuries to the cheeks where the machine gun bullet went through the maxillary sinus, tearing out the ethmoids on one side, a large part of the septum and emerged beneath the orbit on the opposite side. These cases healed up with remarkably little deformity or discomfort.

I remember two cases where machine gun bullets had passed into the mastoid and came out in the opposite orbit, completely exenterating the latter. These healed up without any symptoms other than a one-sided facial paralysis. It is often very hard to trace the path that these projectiles could have taken without touching some vital spot and yet they did it. I suppose there is an explanation for this, and that is that we did not see the cases where the projectiles failed to miss vital organs and saw only those that were missed, and it is really remarkable that in so many cases that we did see these injuries were not fatal.

DR. J. M. INGERSOLL (Cleveland, closing): One of the photographs being passed around shows a soldier in whom the bridge of the nose was destroyed by a machine gun bullet. In the plastic operation to restore the lost portion of the bridge a small portion of the bone over the frontal sinus was transplanted to support the flap coming down from the forehead.

Another photograph shows a rather bad injury on the right side of the face. In this man the outer margin of the orbit and the whole eye were destroyed. The maxillary sinus and the ethmoidal cells and a portion of the right nasal fossa were uncovered. In that case we used such a flap as you spoke of, Major La Maitre, bringing it down from the forehead so as to cover the maxillary sinus and ethmoid cells and a portion of the nose, and in this way make a new lower lid.

We used such flaps quite frequently in unilateral injuries of the nose, but in no case where the nose was completely destroyed did we use flaps from each side to reconstruct the nose. Your suggestion of the use of double flaps interests me and seems to me to be a very logical procedure.

We tried various methods to provide for a lining of the flaps used to replace the nose. We came to the conclusion that the best method of lining such flaps consisted in covering an aluminum nasal splint with skin grafts and inserting them in the nasal fossa under the flap brought

down from the forehead. These splints were held in position by an attachment to the teeth.

In the cases of bad injury of the face and neck we came to the same conclusion you did, Dr. Coates, that in those cases in which the carotid artery was injured the patient succumbed to the injury, and the ones we saw were those who fortunately escaped such injury.

In regard to the mastoid cases: We saw many cases in which the bullet entered one side of the face and passed out through the opposite mastoid, causing facial paralysis. The interesting thing about many of these cases was that in a great majority of them the facial nerve was injured but not severed, and when we removed the foreign bodies and the splintered bone, and in some cases actually uncovered the facial canal, removing all source of irritation, the facial paralysis improved and in many cases became practically well. Of course, we used massage and electricity following the operative procedure.

**The Oto-laryngological Features of the Influenza Epidemic at Camp Hancock, Ga., September-December, 1918.** DR. GEORGE FETTEROLF, Philadelphia.

Seven hundred and seventy men were brought directly to the hospital by train and a real epidemic began and in a very stormy fashion.

The first complication requiring attention consisted of many cases of violent and persistent epistaxis; other phases developed later.

Ear complications were many, and every endeavor was made to attend to these immediately, and for this a twenty-four-hour service was instituted for each day.

In a very few days the patient population jumped from 1,500 to 4,000.

The main difficulty met with in examining and treating the patients was securing adequate illumination, as two-thirds of the sick were on porches or in tents. Often the sunlight or diffuse daylight were used. Careful treatment was given all these cases, the ear drum incision when necessary, with not a single mastoid operation performed in October, and only four such operations were performed in November and five in December, of a total of 7,781 cases of influenza.

**Epistaxis.**—But one obtruding condition was found in the nose, and that was profuse and persistent epistaxis. In every case but one the bleeding point was located at the anterior part of the septum, the so-called locus Kieselbachii. In the one exception a spurting artery was observed on the lateral wall of the nose at the anterior end of the inferior turbinate body. The incidence of epistaxis was the greatest in the first influx of cases. These boys were brought in directly from the troop trains after two days or more of travel, with limited bathing facilities, and it is believed that the irritation and excoriation of the nasal mucosa produced by the train dirt was an important causative factor. Epistaxis became much less frequent in the later days of the epidemic, when the cases were developing in those soldiers who had been in camp for several days.

**Sinusitis.**—The incidence of sinusitis was exceedingly low. Exact figures are not at hand, nor are they obtainable. When a case of this sort developed, a routine spray of adrenalin chlorid 1/7,000 was given every hour, and when the pain was severe the middle meatus was packed for half an hour or more with cotton pledges saturated in the same solution. All of

these cases returned to normal and none required operation for their relief.

Tonsils.—There were very few cases of tonsillitis and still fewer of peritonsillar abscess. During the months of October, November and December there were but thirteen cases requiring the evacuation of pus.

Larynx.—Laryngitis was present in quite a few cases and the manifestations in the larynx were of three different types: (1) Diffuse catarrhal laryngitis, with the usual appearance found in this condition; (2) ulcerative laryngitis, with small, narrow, superficial ulcers running lengthwise of one or both cords, and (3) what might be called "asthenic laryngitis."

A section of ulcerated cord from a case of type 2 was submitted to the pathologist, who reported on the specimen as follows: "Section shows mucosa with an irregular loss of substance, with submucosa exposed, which with muscle tissues still deeper, is infiltrated with polynuclear leucocytes. Diagnosis: Acute inflammation of vocal cords with ulceration."

It was characterized by a normal or slightly reddened mucosa, absence of ulcerative lesions and mainly by a marked weakness of the laryngeal musculature. An attempt at phonation would result in a feeble effort to approximate the vocal cords and an immediate discouraged return of the cords to the respiratory position. A similar condition of the palatal and pharyngeal and probably of the esophageal musculature usually was found to be associated with it. The muscular efficiency of the entire throat was very low, and it was tested out in one patient by having him endeavor to swallow a large mouthful of water. The effort at deglutition immediately was followed by a gush of water from his nose and by cyanosis. It was evident that the muscles of neither his soft palate nor of his larynx had the strength to close off the entrance to the cavities which they guard. In a short while he was able by a few weak coughs to clear his larynx and trachea, but for the moment it looked as if he was in imminent danger of suffocation from the water which he was unable to prevent entering his trachea and then was almost unable to expel from it.

The actual cause of his condition could not be determined. Possibly it was a toxic myositis, possibly just a part of the general asthenia, possibly it was due to a toxemic poisoning of the centers in the medulla, really constituting an acute form of bulbar paralysis.

The members of the oto-laryngologic staff of the bast hospital feel that they were in great good fortune to have been at Camp Hancock during the epidemic. Rarely does a physician or even a collaborating group of physicians have an opportunity of studying synchronously such a large series of cases occurring in people of approximately identical age and living under uniform clothing, housing and dietary conditions. Usually observations on a large number of cases must extend over a long term of years, and under such conditions early impressions and conclusions are likely to grow hazy and later ones assume undue prominence and force. While necessarily conditions in this epidemic were such that accurate record of all phases of the influenza was impossible, still it is felt that so careful an estimate has been made where accurate records were not obtainable that conclusions drawn can fairly be considered as being based actually on numerical fact.

## DISCUSSION.

DR. N. H. PIERCE (Chicago): I congratulate the writer on his excellent results in the treatment of acute inflammations of the ear. His methods are founded on principles that have grown out of known pathology in these cases and represent the most modern ideas in the treatment of these diseases. There is a definitely defined rule that the occurrence of mastoid trouble necessitating operation is in direct relationship to the length of time elapsing between the onset of an acute otitis media and the opening of the tympanic membrane. The tympanic membrane cannot be opened too early. It is infinitely safer to err on the side of opening the tympanic membrane early in acute cases. In fact, it is better to open the tympanic membrane in the acute infectious diseases for exploration purposes, even when there is no sign of bulging or very little sign of hyperemia—always, of course, under strict aseptic and antiseptic conditions.

It is curious what a difference there is in the reports of cases from the various camps as to the frequency of mastoid operation. In some camps, especially in the Southern States, it was quite the rule to have one or two entire wards full of operative mastoid cases. I cannot help believing that even in the presence of the very virulent infections from which they suffered there were a great many mastoids opened unnecessarily.

In my own experience in this country and abroad I have performed between thirty and forty mastoidecomies, and in some of these the operation was performed in chronic suppurative processes. Of these cases only one died from complications—that is, of all the cases of acute chronic mastoid trouble that I saw in my experience in this country and abroad but one death resulted from complications, and that was a case where, on the fourth day after the admission to the hospital, thrombosis extended into the right arm, and I believed that nothing in the world in the way of operation could save such a case.

DR. D. C. GREENE (Boston): I would like to add one observation that we made at Camp Sevier. Our experience was very much the same as Major Fetterolf's, with one exception, and that is with reference to sinus involvement. We had, it is true, very few cases of sinus disease in which the clinical diagnosis was made, and we had, unfortunately, very few autopsies in the cases which died, but we did have fifteen cases which came to autopsy in which the head was opened, and the surprising thing was that of these fifteen cases eight showed definite disease of the sinuses. In each of the eight the sphenoid was involved and in several other sinuses also. It seems evident, therefore, that many cases of sinus disease must have escaped our attention because they did not give clinical symptoms at the time.

DR. GEORGE M. COATES: We had an epidemic of influenza at the hospital center in France where I was stationed, although it was rather light in character, and we observed many of the details Major Fetterolf has spoken about. In practically every case that died an autopsy was made, and at every autopsy there was a thorough examination of all the accessory sinuses and the middle ears. If I recollect rightly, in something like 90 per cent we found pus in one or both of the middle ears and one or more of the sinuses—the sphenoid more frequently than any of the others, almost entirely occupied with administrative work, but, as we had no ever of either middle ear or sinus trouble. At that particular time I was almost entirely occupied with administrative work, but, as we had no other throat men connected with the hospital, I did see a great many of

the cases where symptoms were present. I recollect very few, if any, cases of epistaxis, but we did notice many asthenic laryngeal cases characterized chiefly by aphonia, and they bothered us a great deal, because at that time we were having an epidemic of laryngeal diphtheria. We also had a great many gas cases in the hospital, and it was often a hard question of diagnosis, with the facilities at hand, to determine what these aphonia cases were due to. Our laryngeal diphtheria cases came on very suddenly, and in one or two instances died of pneumonia without any laryngeal examination having been made, the patient having been practically symptomless except for the aphonia. After this I made it a routine practice to examine the larynx of every case showing any symptoms whatever, and also all the diphtheria and pneumonia cases.

It was very difficult to make competent laryngeal examinations, because our hospital was so crowded. We had very poor facilities for making them, but in a good many cases we were able to make correct diagnoses and a number were saved by prompt tracheotomy.

I want to congratulate Major Fetterolf for the fine organization he had at Camp Hancock for this work. We had attempted to develop an organization at the base hospital at Camp Sevier similar to the one he has just described. It was at the very opening of the hospital, in September, 1917, and we were very much handicapped, because there were only two of us to do the work. We had practically no instruments to work with, our equipment being limited to one set of aural specula, one nasal speculum, one metal tongue depressor, no headlights, no illumination of any kind. We were forced to use, when we could, the daylight and depend on candles or lanterns when we could get them, or electric flashlights. The measles cases came in by hundreds, and it was very difficult work. Afterwards, when we got our system going in proper shape and more help arrived, we were able to see all these middle ear complications practically at their beginning, and yet, in spite of our utmost care, we had, I think, between sixty and seventy mastoid operations. These mastoids were all late cases, made so deliberately, because of the very poor physique of the men we had to work on. If they were measles cases they all had bronchitis, many of them pneumonia, almost all hookworm, and were wretched specimens to do any work on. We, therefore, attempted to carry them along as far as possible before bringing them to the operating table.

Naturally, under this system we had some fairly bad mastoids, but the only one we lost was a man who came in with brain abscess and meningitis and died in a few hours.

DR. T. P. BEEENS (New York): In General Hospital No. 1, during the epidemic of influenza in September and October, there were approximately 1,200 cases of influenza brought in.

There was a class of cases up there, however, where the mastoids had been operated on months before, many months before my arrival on the 5th day of June, some of them done in other hospitals, military hospitals, and transferred to us. There were about thirty unhealed, post-operative mastoid wounds, and in all of those cases there had been simply what I might call a scratch operation, excepting that in many of the cases mutilating operation had been done on the external auditory canal. In some of the cases the skin even was absent from the external auditory canal. It made the operations extremely difficult.

Results: As to hearing bad, but not a death—one passing partial paralysis.



Christian R. Holmes:

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#### IN MEMORIAM.

Christian Rasmus Holmes, of Cincinnati, eminent ophthalmologist, and otologist, Dean of the Medical Department of the University of Cincinnati, organizer of the forces for the establishment of the Cincinnati General Hospital, former president of a number of the national Ophthalmological and Otological Associations, earnest advocate of higher standards for medical education, is dead. Dr. Holmes died in the Post-Graduate Hospital, New York City, January 9, after a short illness.

He was born in Copenhagen, Denmark, October 18, 1857. His early training was in civil engineering. On the death of his father he came with his mother to Cincinnati, took up the study of medicine and graduated from the Miami Medical College in 1886. His first professional work in ophthalmology was as assistant to Dr. Joseph Aub, of Cincinnati, whom he succeeded in this specialty.

Early in his professional career, Dr. Holmes appreciated the necessity of a thoroughly equipped modern City Hospital in his home city and recognized the necessity of consolidating the factions of the two leading medical colleges of Cincinnati toward the establishment of such a hospital. For ten years he labored diligently toward this end, visiting hospitals in Europe and in America, and with his logical, analytical mind accumulating data to effect his

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cherished plan. With his ability as an organizer he developed an educational campaign to place before the citizens of Cincinnati the necessity and the value of a new City Hospital that would make possible the best in hospital construction, the realization of higher standards in medical education and the best equipment and care for the community. To those of his intimates familiar with his methods of work, it was a rare satisfaction to follow the progress of these efforts. It included the consummation of the merger of the Medical College of Ohio and the Miami Medical College into the University of Cincinnati in 1909; it proved the value of popular education in medicine and hygiene, an interesting phase of this task which he developed by organizing courses of lectures by trained lecturers to prepare the citizens of Cincinnati for their needed co-operation, culminating in a popular vote by a large majority to endorse the plans of construction, equipment and charter of the new Cincinnati General Hospital. In framing the charter which made the Medical Department of this hospital a part of the University of Cincinnati, whose trustees should have the sole right to elect the staff and supervise the nursing department, he achieved a splendid modern plan of civic co-operation and, incidentally, succeeded in the establishment of one of the first and foremost teaching hospitals of America. It was indeed a great accomplishment.

His humane, idealistic and progressive ideas in and for the medical profession made him and his influences a tower of strength for the higher and better qualities of the profession. He was an indefatigable student, a painstaking searcher in scientific literature, a

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thoroughly qualified ophthalmologist and oto-rhinologist and a frequent and able contributor to the literature of his specialties. He was especially endowed with one of the most profoundly effective qualities as a medical practitioner,—“common-sense.” His discussions in every medical organization in which he participated were clean-cut, authoritative and illuminating.

In this issue of *THE LARYNGOSCOPE* appears his posthumous contribution on “Sinus Thrombosis,” perhaps the last article he wrote. On America’s entrance into the World-War he was commissioned Major, M.R.C., in 1917, and placed in charge of the Eye, Ear, Nose and Throat Department at the Base Hospital, Camp Sherman, Chillicothe, Ohio, where he remained until the end of hostilities. His service in this department among the Base Hospitals of America was one of the model Head-Surgery Departments in the Army. As a teacher of special medicine, Dr. Holmes was pre-eminently qualified and received general recognition. He was Professor of Otology in Miami Medical College, 1890-1904; Professor of Ophthalmology in the Laura Memorial Medical College and Presbyterian Hospital, 1892-1903, and Professor of Otology and Dean of the Medical Department of the University of Cincinnati since 1904.

He was Ophthalmologist and Otologist to the Cincinnati Hospital, 1888-1899, and Consulting Ophthalmologist to this institution since 1908.

He was Third Vice-President of the American Medical Association, 1902-1903; Chairman of the Section on Laryngology and

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Otology, 1904-1905; Chairman of the Section on Ophthalmology, 1905-1906. He was President of the American Academy of Ophthalmology and Oto-Laryngology, 1901-1902; President of the American Ophthalmological Society, 1908-1909; President of the American Laryngological, Rhinological and Otological Society, 1908-1909; President of the American Otological Society, 1917-1918.

He was a splendid example of real manhood, of honesty of purpose, of strength of conviction, of fair-mindedness, of good comradeship, of sincere friendship and of highest ideals.

To those of his intimates who enjoyed the privilege of his closer association and friendship he was an example for good, an inspiration for better things and a constant stimulus for work. By his death the medical profession at large has lost an ardent and earnest champion; the ophthalmological and otological world one of its most eminent and best-qualified workers and representatives; the people of Cincinnati a real benefactor; American an exemplary citizen; his close associates and intimate friends, a loving brother and an inspiring force, and his family its noblest jewel.

As one of this closer circle, may I publicly express my condolence and sympathy to his devoted wife and family and to my fellow oto-laryngologists who have been privileged with me these many years to enjoy the intimate association of this truly great man.

M. A. G.

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